

**ENG-1101**  
**Model Question Paper**  
**English**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**  
**Semester-1**

Time: 3 hours

Max marks: 70

Answer Question No.1 compulsorily and  
any Four questions from remaining.  
All questions carry equal marks.

All parts of a question must be answered at one place only.

1. a) Write an Essay on “Commercialization of Education”. 8M
- b) Correct the following sentences. 4M
- i. She likes dogs, but she don't like cats.
  - ii. I has not seen them yet.
  - iii. One of my friends are going to Mumbai.
  - iv. I have seen him yesterday.
- c) Use the appropriate articles in the given blanks (a, an, the, no article) 2M
- i. I bought .....pair of shoes.
  - ii. I saw.....movie last night.
  - iii. Did you get married after leaving .....university?
  - iv. I was at.....train station when you called me.
2. a) Write a feasibility report for setting up a Water / Power Unit at your campus. 8M
- b) Pick any Four of the following and explain them in one word and write sentences of your own using each word. 4M
- i. Language which is confusing and unintelligible.
  - ii. One who prepares plans for buildings.
  - iii. A great lover of books
  - iv. A person in charge of a museum
  - v. A man who thinks only for himself
  - vi. One who kills animals and sells their flesh
- C) Write the appropriate quantifiers for each sentence. 2M  
(Some, few, much, lesser,)
- i. There were ..... at the college last year
  - ii. The project is ..... complicated that the last one
  - iii. I have to buy .....pairs of blue and black jeans soon.
  - iv. How .....cash do you need to purchase this CD player
3. a) Write a letter to a renowned person, requesting him to be the Chief Guest for the cultural festival of your college. 8M
- b) Identify the types of the following sentences and write a similar sentence for each type. 4M
- i. Oh, what a beautiful morning!
  - ii. Eat your supper.
  - iii. Today is my birthday.
  - iv. What gifts did you receive for your birthday?

c) Re-write the sentences by using Gerunds and infinitives forms. 2M

- i. She is good at..... (dance)
- ii. He is crazy about..... (sing)
- iii. He'd like..... (fly) an aeroplane.
- iv. I enjoy..... (write) picture postcards.

4. a) Draft an E-Mail to your friend about your career plans. 8M

b) Punctuate the following sentences taken from the text correctly. 4M

- i. Sunil Sharma is Documentation Development Manager at Cerner Corporation one of the world's largest medical software developers
- ii. As part of his job Sunil writes web-based content for Cerner
- iii. One type of website that Cerner develops is marketed to health facilities for use by doctors nurses hospital administrators and patients
- iv. This explains the communication challenge that Sunil faces. Cerner's end user is diverse consisting of lay readers and high-tech specialists

c) Pick the right synonyms of the following words. 2M

- |                 |             |               |              |
|-----------------|-------------|---------------|--------------|
| i. Euphoria     | ii. Vicious | iii. Remnant  | iv. Acclaim  |
| a) Sober        | a) cruel    | a) horror     | a) praise    |
| b) High spirits | b) kind     | b) whole sale | b) blame     |
| c) Mean         | c) splendid | c) left over  | c) honour    |
| d) Feeble       | d) dearest  | d) energize   | d) criticism |

5. a) Develop a paragraph based on the following hints. The hints are from the text in about 150 words. 8M

As the 11th President of India---- the Indian National Congress-----‘people’s president’, he was-----. His contribution -----Bharat Ratna. During -----in India. He is the --- ----India: 2020 and Ignited Minds.

b) Fill in the blanks with appropriate idioms from the box. 4M  
(The cream of the crop, an arm and a leg, Eager beaver, shape up)

- i. Frank always tries to finish his work before everyone else. He is an \_\_\_\_\_.
- ii. We chose the prettiest, best behaved puppy. She was certainly \_\_\_\_\_.
- iii. If Madge doesn't \_\_\_\_\_, she could lose her job.
- iv. Our new office was very expensive. It cost \_\_\_\_\_.

c) Pick the right antonyms of the following words. 2M

- |           |            |             |                |
|-----------|------------|-------------|----------------|
| i. Awake  | ii. Create | iii. Emerge | iv. Warm       |
| a) alive  | a) build   | a) abandon  | a) cold        |
| b) stir   | b) beak    | b) appear   | b) pleasant    |
| c) asleep | c) deny    | c) fall     | c) unkind      |
| d) truce  | d) refuse  | d) hide     | d) indifferent |

6. a) Draft a pamphlet on any Electronic home appliances/Places of tourists' interest/an Educational institution. 8M
- b) Fill in the blanks using the appropriate forms of verbs given in the brackets. 4M
- The wind \_\_\_\_ furiously. (Blow)
  - He \_\_\_\_ to his mother every week. (Write)
  - In a fit of rage, she \_\_\_\_ up the letter. (Tear)
  - We couldn't have \_\_\_\_ a better day for organizing the party. (Choose)
- c) Fill in the blanks with appropriate prepositions from the box. 2M  
(in ,at, the, at, on,)
- They are staying at \_\_\_\_ hotel
  - That is \_\_\_\_ girl I told you about
  - My birthday is \_\_\_\_ May
  - We are going to see my parents \_\_\_\_ the weekend

7. a) Present an argument in about 150 words on 'Women are not suitable to work in the industry.' Substantiate your argument with reasons. 8M
- b) Read the following paragraph and answer the questions : 4M

The study of history provides many benefits. First, we learn from the past. We may repeat mistakes, but, at least, we have the opportunity to avoid them. Second, history teaches us what questions to ask about the present. Contrary to some people's view, the study of history is not the memorization of names, dates, and places. It is the thoughtful examination of the forces that have shaped the courses of human life. We can examine events from the past and then draw inferences about current events. History teaches us about likely outcomes.

Another benefit of the study of history is the broad range of human experience which is covered. War and peace are certainly covered as are national and international affairs. However, matters of culture (art, literature, and music) are also included in historical study. Human nature is an important part of history: emotions like passion, greed, and insecurity have influenced the shaping of world affairs. Anyone who thinks that the study of history is boring has not really studied history.

- What is the main idea of this passage?
  - In the first paragraph, inferences mean?
  - Which method of teaching history would the author of this passage support?
  - In the second paragraph, shaping of world affairs Means.
- c) Fill the blanks by using appropriate conjunctions (because, neither-nor, and, and) 2M
- Receptionists must be able to relay information \_\_\_\_ pass messages accurately.
  - Mary is a member of the Historical Society \_\_\_\_ the Literary Society.
  - Susie \_\_\_\_ phoned \_\_\_\_ wrote after she left home.
  - The committee rejected the proposal \_\_\_\_ they did not think it was practical.

**ENG-1102**  
**Model Question Paper**  
**MATHEMATICS-I**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**  
**Semester-1**

Time: 3 hours

Max marks: 70

**First question is compulsory. And answer any Four out of the remaining seven questions. All questions carry equal marks. All parts of a question must be answered at one place only; otherwise they will not be valued.**

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**PART – I**

1. (a) Find the value of  $\frac{du}{dt}$  from given  $u = y^2 - 4x$ ,  $x = 2t^2$ ,  $y = 4t$ .
- (b) If  $u = \sin^{-1} \frac{x}{y} + \tan^{-1} \frac{y}{x}$ , then prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$ .
- (c) Write the necessary conditions for  $f(x, y)$  to have a maximum or minimum at  $(a, b)$ .
- (d) Formulate a differential equation from the relation  $y = A \cos x + B \sin x$ .
- (e) Find the particular integral of the differential equation  $\frac{d^2 y}{dx^2} + \frac{dy}{dx} + y = (1 - e^x)^2$ .
- (f) Test the convergence of the series  $\sum \left( \frac{n}{n+1} \right)^n$ .
- (g) Define the absolute and conditional convergence of a series. Give simple examples.

**PART – II**

2. (a) If  $x^x y^y z^z = c$ , show that  $\frac{\partial^2 z}{\partial x \partial y} = -(x \log ex)^{-1}$ .
- (b) If  $u = \frac{x+y}{1-xy}$  and  $v = \tan^{-1} x + \tan^{-1} y$ , then find  $\frac{\partial(u, v)}{\partial(x, y)}$ . Are  $u$  and  $v$  functionally related. If so, find this relationship.
3. (a) Expand  $e^x \sin y$  at  $(-1, \frac{\pi}{4})$  as far as the terms of third degree.
- (b) Using the method of differentiation under the integral sign, prove that  $\int_0^{\infty} e^{-x} \frac{\sin ax}{x} dx = \tan^{-1}(a)$ .
4. (a) Solve  $\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$ .

(b) Solve  $x dy - y dx + a(x^2 + y^2) dx = 0$  by reducing into exact form.

5. (a) Find the orthogonal trajectories of the family of coaxial circles given by

$$x^2 + y^2 + 2\lambda x + c = 2, \lambda \text{ being the parameter.}$$

(b) The number  $N$  of bacteria in a culture grew at a rate proportional to  $N$ . The value of  $N$  was

initially 100 and increased to 332 in one hour. What would be the value of  $N$  after  $1\frac{1}{2}$  hours?.

6. (a) Solve  $\frac{d^2 y}{dx^2} - 2\frac{dy}{dx} + 10y = 0$ , when  $y = 4$  and  $\frac{dy}{dx} = 1$  at  $x = 0$ .

(b) Solve  $(D^2 - 4D + 3)y = \sin 3x \cos 2x$ .

7. (a) Solve  $\frac{d^2 y}{dx^2} + y = \tan x$  by applying the method of variation of parameters.

(b) Solve  $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} + 2y = 10\left(x + \frac{1}{x}\right)$ .

8. (a) Test for convergence of the series  $\frac{1}{2\sqrt{1}} + \frac{x^2}{3\sqrt{2}} + \frac{x^4}{4\sqrt{3}} + \frac{x^6}{5\sqrt{4}} \dots \infty$ .

(a) For what values of 'x' is the series  $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} \dots \infty$  convergent?

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**ENG-1103**  
**Model Question Paper**  
**MATHEMATICS-II**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**  
**Semester-1**

Time: 3 hours

Max marks: 70

Part A is compulsory.  
Answer any FOUR questions from Part B.  
Each question will carry 14 marks.

PART A

1. a) Find the value of  $\lambda$  for which the system of equations  $2x + y + 2z = 0$ ,  
 $x + y + 3z = 0$ ,  $4x + 3y + \lambda z = 0$  have a non-zero solution.
- b) Define Hermitian matrix and give an example.
- c) Write any two properties of Laplace transforms
- d) Find the Laplace transform of unit step function
- e) Find  $L^{-1}\left(\frac{s^2 - 3s + 4}{s^3}\right)$ .
- f) Write the expressions for  $J_{\frac{1}{2}}(x)$  and  $J_{-\frac{1}{2}}(x)$ .
- g) Express  $x^2 - 2x + 5$  in terms of Legendre polynomials.

PART B

2. a) Find the rank of the matrix  $A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$  by reducing into normal form.
- b) Find the eigen values and eigen vectors of the matrix  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ .
3. a) Verify Cayley-Hamilton theorem for the matrix  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$  and use it to evaluate the matrix equation  $A^6 - 6A^5 + 9A^4 - 2A^3 - 12A^2 + 23A - 9I$ .
- b) If  $A = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$  then show that  $(I - A)(I + A)^{-1}$  is a unitary matrix.
4. a) Reduce the quadratic form  $2xy + 2xz - 2yz$  to canonical form by an orthogonal

transformation and discuss its nature.

b) Solve:  $x + 2y + 3z = 14$ ,  $2x + 3y + 4z = 20$ ,  $3x + 4y + z = 14$  by Gauss elimination method.

5. a) Find i)  $L\left\{\frac{\cos at - \cos bt}{t}\right\}$     ii)  $L\left\{\int_0^t e^{-t} \cos t dt\right\}$ .

b) Find the Laplace transform of the triangular wave function of period  $2a$  given by

$$f(t) = t, \quad 0 < t < a \\ = 2a - t, \quad a < t < 2a.$$

6. a) Evaluate: i)  $L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\}$     ii)  $L^{-1}\left\{\frac{3s}{s^2 + 2s + 8}\right\}$ .

b) State Convolution theorem and use it to evaluate  $L^{-1}\left\{\frac{1}{(s-2)(s+2)^2}\right\}$ .

7. a) Using Laplace transformation method, solve:  $y'' + 2y' - 3y = \sin t$ ,  $y = y' = 0$  at  $t=0$ .

b) Prove that  $J'_n(x) = \frac{1}{2}[J_{n-1}(x) - J_{n+1}(x)]$ .

8. a) Prove that  $\int_{-1}^1 P_n^2(x) dx = \frac{2}{2n+1}$ .

b) Prove that  $P_n(x) = \frac{1}{2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$ .

**ENG-1104**  
**Model Question Paper**  
**Chemistry**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**  
**Semester-1**

Time: 3 hours

Max marks: 70

**Question No.1 is compulsory.**  
**Answer any FOUR from the remaining.**  
**All questions carry equal marks.**

1. Explain the following terms in short:
  - (a) Pitting corrosion
  - (b) EMF of a cell
  - (c) Paints
  - (d) Polymer
  - (e) Break-point chlorination
  - (f) Semiconductors.
2.
  - (a) Explain boiler troubles and write methods to remove.
  - (b) How do you determine hardness of water by complexation method.
3.
  - (a) Discuss the band theory of solids.
  - (b) Write short note on zone refining.
4.
  - (a) What are the different types of polymerisation?
  - (b) Write the preparation and properties of Nylon-6,6 and Bakelite.
5.
  - (a) Write the different types of corrosion.
  - (b) Discuss the various methods of corrosion control.
6.
  - (a) Discuss the manufacture of cement.
  - (b) What is meant by hardening and setting properties of cement.
7.
  - (a) Discuss the fractionation of crude oil.
  - (b) Explain cetane-number and octane-number.
8.
  - (a) What are lubricants? Discuss any four properties of lubricants.
  - (b) Write short note on types of propellants and their applications.



**ENG-1106**  
**Model Question Paper**  
**COMPUTER PROGRAMMING NUMERICAL METHODS**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**

Time: Three Hours

Maximum Marks: 70

Answer any FIVE questions  
First question is compulsory  
Answer any FOUR from the remaining questions.  
All questions carry equal marks

1. a) Write the precedence rules for arithmetic operators and give example.  
b) What is keyword? Write any five keywords and explain them.  
c) What are the advantages of functions?  
d) Distinguish between local and global variables.  
e) What is meant by structure within structure? Explain briefly.  
f) Explain Bisection method.
2. a) Write the general forms of if-else and switch-case statements and compare them.  
b) Write a program to compute roots of quadratic equation using switch-case statement.
3. a) What are loops? Explain various loop statements with suitable example.  
b) Write a C program to find the sum of digits in a given number.
4. a) Explain the following concepts associated with functions :
  - i) Function declaration.
  - ii) Function definition and
  - iii) Function call.
5. a) What is a Pointer? How is it initialized? What is the function of a pointer variable? What are its uses?  
b) Explain the concept of pointers to structures with suitable example.
6. a) Explain the following
  - i) Structure
  - ii) Accessing elements in structure
  - iii) Arrays of structures  
b) Write a program to process employee records by using structures.
7. a) Briefly explain file handling functions.  
b) Write a C program to copy the contents of one file to another file.
8. a) Find the root of the following equation using Newton-Raphson method, correct the result upto 3 decimal places.  
$$x^3 - 3x5 = 0$$
  
b) Evaluate  
$$\int_2^{-2} \sin(x) dx$$
 using Simpson's rule.

**ENG-1108**  
**Model Question Paper**  
**History of Science and Technology**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**

Time: Three Hours

Maximum Marks: 70

Answer Question No.1 compulsorily and  
any Four questions from remaining.

All questions carry equal marks.

All parts of a question must be answered at one place only.

1. Write short answers for the following.
  - a) Explain the terms Science and Technology.
  - b) Describe the role of Scientist in the society.
  - c) Science and Technology Policy resolutions.
  - d) Defense Spin-offs.
  - e) Biosensors.
  - f) Barriers of Technological change.
  - g) Types of Technology transfer.
2. Describe the roots of science and technology in ancient period in India.
3. Explain the salient features of new technology fund and programs aimed at technological self reliance.
4. Describe the achievements of Council of Scientific and Industrial Research.
5. Explain the salient features of Space program and INSAT services.
6. Explain the importance of Nuclear energy and describe the nuclear explosion and India's safety measures.
7. Describe the importance of Ocean development and explain the marine research and capacity building.
8. What is Appropriate technology? Explain the criteria for selection of an appropriate technology.

**ENG-1201**  
**MODEL PAPER**  
**I/IV B.Tech. Degree Examination &**  
**I/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**MATHEMATICS-III**  
**(Common for All Branches)**  
**(Effective from the admitted batch of 2015-2016)**

Time: 3 Hrs

Max. Marks: 70

**Answer all questions in Part A and Four questions from Part B**

All questions carry equal marks

**Questions of Part A must be answered at one place**

**Part A**

1. (a) Find the angle between the line  $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$  and the plane  $3x + y + z = 7$ .
- (b) Define right circular cylinder.
- (c) Change the integral  $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$  into polar coordinates.
- (d) Express  $\int_0^{\frac{\pi}{2}} \sqrt{\tan \theta} d\theta$  in terms of gamma function.
- (e) Evaluate  $\int_0^1 \int_0^{1-y} xy dx dy$  using Dirichlet's integral.
- (f) Is the function  $f(x) = \begin{cases} -1+x, & -1 < x \leq 0, \\ -1-x, & 0 \leq x < 1 \end{cases}$  odd or even? Justify.
- (g) State the Dirichlet's conditions for the expansion of a function as Fourier series.

**Part B**

2. (a) Find the image of the point (2, -1, 3) in the plane  $3x - 2y - z - 9 = 0$ .
- (b) Find the magnitude and the equations of the shortest distance between the lines  $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+3}{4}$  and  $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$
3. (a) Find the equation of the sphere having its centre on the plane  $4x - 5y - z = 3$  and passing through the circle  $x^2 + y^2 + z^2 - 2x - 3y + 4z + 8 = 0, x - 2y + z = 8$ .
- (b) Find the equation of the right circular cone generated by rotating the line  $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$  about the line  $\frac{x}{-1} = \frac{y}{1} = \frac{z}{2}$ .
4. (a) Evaluate the integral by changing the order of integration  $\int_0^3 \int_1^{\sqrt{4-y}} (x+y) dx dy$ .
- (b) Find by double integration the area of the lemniscate  $r^2 = a^2 \cos 2\theta$ .

5. (a) Evaluate the integral  $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z \, dz \, dx \, dy$ .

(b) Find the volume common to the cylinders  $x^2 + y^2 = a^2$  and  $x^2 + z^2 = a^2$ .

6. (a) Find the centroid of the area enclosed by the parabola  $y^2 = 4ax$ , the x-axis and its latus rectum.

(b) Prove that  $\int_0^1 \frac{x \, dx}{\sqrt{1-x^2}} = \frac{1}{5} \beta\left(\frac{2}{5}, \frac{1}{2}\right)$ .

7. (a) Find the Fourier Series of  $f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2-x), & 1 \leq x \leq 2 \end{cases}$ ,  $f(x+2) = f(x)$  for all x.

(b) Expand  $f(x) = \begin{cases} 0, & 0 \leq x \leq \pi \\ \sin x, & \pi \leq x \leq 2\pi \end{cases}$  as Fourier Series.

8. (a) Find the half range cosine series for  $f(x) = x$  in  $0 < x < 2$ .

(b) Expand  $f(x) = \begin{cases} \frac{-(\pi+x)}{2} & \text{for } -\pi \leq x < 0 \\ \frac{(\pi-x)}{2} & \text{for } 0 \leq x < \pi \end{cases}$  as a Fourier series and hence deduce that

$$\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}.$$

**ENG-1202**  
**MODEL PAPER**  
**I/IV B.Tech. Degree Examination &**  
**I/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**PHYSICS**  
**(Common for All Branches)**  
**(Effective from the admitted batch of 2015-2016)**

Time: 3 Hrs

Max. Marks: 70

Answer FIVE questions.  
The First question is compulsory.  
Answer any FOUR out of the remaining Seven.

1. (a) State and Explain first law of thermodynamics. (4)  
(b) What is electric flux explain. (3)  
(c) Explain double refraction (4)  
(d) Explain the basic principle of optical fibre.(3)
2. (a) Explain the working of Carnot's heat engine. Obtain an expression for its efficiency. (10)  
(b) Explain the concept of entropy? (4)
3. (a) State and prove Gauss theorem in electrostatics. (7)  
(b) Explain what is Hall effect and its importance. (7)
4. (a) State and explain Ampere's law. (4)  
(b) Discuss the growth and decay of current in L-R circuit.(10)
5. (a) Obtain the conditions for the interference of light reflected by a thin parallel film. (7)  
(b) Discuss the qualitative description of diffraction of light at single slit. (7)
6. (a) Explain what is population inversion and pumping in lasers? (4)  
(b) With neat diagrams, describe the principle, construction and working of Ruby laser.  
Discuss the applications of lasers.(10)
7. (a) What is Piezoelectric effect? Explain how Ultrasonics can be generated by piezoelectric phenomena. (8)  
(b) State and explain Heisenberg's uncertainty principle. (6)
8. (a) Derive Schrödinger time independent wave equation. (8)  
(b) What are nano materials? Give some applications of nano materials. (6)

**ENG-1204**  
**Model Question Paper**  
**ENGINEERING GRAPHICS**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**

**Time: 3 hrs**

**Marks: 70**

Part A is compulsory. Answer any Four questions from Part B.  
 Part A is to be answered on the main answer book and Part B on the drawing sheet.  
 All questions carry equal marks.  
 Assume the missing data if any, suitably.

**PART-A**

1. Write the following in brief:
  - (a). What is representative fraction?
  - (b). Define the term horizontal trace.
  - (c). What is meant by oblique plane?
  - (d). What are the different types of solids?
  - (e). Define the term section plane.
  - (f). State the methods of development.
  - (g). Define isometric scale.

**PART-B**

2. Construct an ellipse when the distance of the focus from the directrix is equal to 50 mm and eccentricity is  $\frac{2}{3}$ .
3. A line AB, 75 mm long, is inclined at  $45^\circ$  to the H.P. and  $30^\circ$  to the V.P. Its end B is in the H.P. and 40 mm in front of the V.P. Draw its projections.
4. Draw the projections of a regular pentagon of 40 mm side, having its surface inclined at  $30^\circ$  to the H.P. and a side parallel to the H.P. and inclined at an angle of  $60^\circ$  to the V.P.
5. Draw the projections of a cone, base 45 mm diameter and axis 50 mm long, when it is resting on the ground on a point on its base circle with the axis making an angle of  $30^\circ$  with the H.P. and its top view making  $45^\circ$  with the V.P.
6. A hexagonal prism, has a face on the ground and the axis parallel to the V.P. It is cut by a vertical section plane, the H.T. of which makes an angle of  $45^\circ$  with xy and which cuts the axis at a point 20 mm from one of its ends. Draw its sectional front view and the true shape of the section. Take side of the base 25 mm long and height 65 mm.
7. Draw the development of the lateral surface of the part P of the cylinder in Fig.1.
8. Draw the isometric view of the below Fig.2.

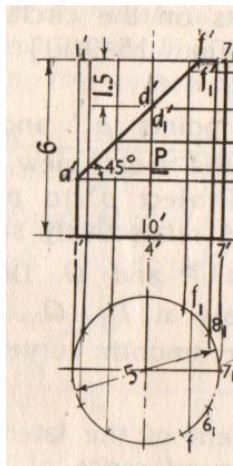


Fig.1.

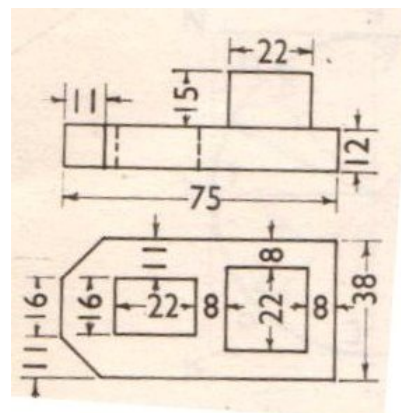


Fig.2

**ENG-1206**  
**Model Question Paper**  
**PROFESSIONAL ETHICS AND HUMAN VALUES**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**

Time : Three hours

Maximum : 70 marks

Question No.1 is compulsory.  
Answer any FOUR from the remaining  
All questions carry equal marks.

1. Write short answers for the following:
  - (a) Ethical Vision
  - (b) Profession and Professionalism
  - (c) Environmental Ethics
  - (d) Bhopal Gas Tragedy
  - (e) Gender discrimination
  - (f) Cyber Crimes
  - (g) Engineers as Managers
2. Discuss the scope and aim of Engineering Ethics.
3. Explain the role of Engineers in promoting ethical climate.
4. What are Values? Explain in detail the classification of human values.
5. Elucidate the moral responsibility of engineers towards safety and risk.
6. Define the concept of globalization and explain the role of MNCs in our country.
7. What are the functions of various sample codes of ethics?
8. Discuss the need to focus on professional ethics.

**DS-1208**  
**Model Question Paper**  
**INORGANIC CHEMISTRY**  
**Common to all Branches of I/IV B. Tech (FOUR YEAR COURSE)**  
**&**  
**I/VI B. TECH+M.TECH (SIX YEAR DOUBLE DEGREE COURSE)**  
**(Effective from 2015-2016 Admitted Batch)**

Time : Three hours

Maximum : 70 marks

Question No.1 is compulsory.  
Answer any FOUR from the remaining  
All questions carry equal marks.

1. (a) Explain the dual nature of matter.  
(b) What is de-Broglie's wavelengths?  
(c) What is Resonance?  
(d) How ionization potential varies among groups in the Periodic Table?  
(e) Define crystal field stabilization energy (CFSE).  
(f) What is the importance of significant figures in the representation of analytical data?  
(g) Define standard deviation.
2. (a) Explain Radial and angular functions of Hydrogen atom.  
(b) Write the important postulates of Rutherford's model.
3. (a) Discuss the classification of elements in the Periodic Table.  
(b) Discuss the variation of electron affinity among the elements in the periods.
4. (a) Write the important postulates of Molecular orbital theory.  
(b) Draw and explain the M.O. diagram of  $O_2$  molecule.
5. (a) How do you explain the multiple bonding characters of Second period elements and higher period elements?
6. (a) Write the salient features of valence bond theory.  
(b) Explain the bonding in  $BF_3$  and  $CH_4$  according to V-B. Theory.
7. (a) Describe the general physical and chemical properties of first Transition series.  
(b) How do you calculate the crystal Field stabilization energy in Coordination compounds?
8. (a) Explain the classification of reactions in titrimetric analysis with examples.  
(b) Explain the classification of errors with examples.



CHE-2.1.1

MODEL QUESTION PAPER  
II/IV B.Tech (CHEMICAL & BIOTECH) Degree Examination &  
II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)

First semester  
CHEMICAL ENGINEERING  
MATHEMATICS-IV  
(Effective from the admitted batch of 2015-16)

Time: 3 hrs

Marks:70

Answer all questions in Part A and Four questions from Part B

All questions carry equal marks

Questions of Part A must be answered at one place only

Part A

- (a) Find a unit normal to the surface  $x^2yz + 4xz^2 = 5$  at the point  $(1, -2, 1)$ .  
(b) State Green's theorem in the plane.  
(c) If  $\vec{A}$  and  $\vec{B}$  are irrotational, then prove that  $\vec{A} \times \vec{B}$  is solenoidal.  
(d) Find the partial differential equation of all spheres whose centers lie on the Z-axis.  
(e) Solve  $\frac{\partial^3 z}{\partial x^3} - 4 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial x \partial y^2} = 0$   
(f) State change of scale and shifting properties of Fourier transform  
(g) Find the finite Fourier sine transform of  $f(x) = 2x, 0 < x < 4$ .

Part B

- (a) Prove that  $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$   
(b) Show that  $\vec{A} = 3x^2yI + (x^3 - 2yz^2)J + (3x^2 - 2y^2z)K$  is irrotational, but not solenoidal  
Also, find  $\phi$  such that  $\vec{A} = \text{grad } \phi$ .
- (a) Compute the line integral  $\int_C (y^2 dx - x^2 dy)$  about the triangle whose vertices are  $(1, 0)$ ,  $(0, 1)$  and  $(-1, 0)$ .  
(b) Verify Stokes's theorem for  $\vec{F} = (y - z + 2)I + (yz + 4)J - xzK$ , where S is the surface of the cube  $x = 0, y = 0, z = 0, x = 2, y = 2, z = 2$  above the xy plane.
- (a) Using divergence theorem, evaluate  $\int_S \vec{R} \cdot \vec{N} ds$ , where S is the surface of the sphere  $x^2 + y^2 + z^2 = 9$ ,  $\vec{R} = xi + yj + zk$ .  
(b) Solve  $(z - y)p + (x - z)q = y - z$ .
- (a) Solve  $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = \cos x \cos 2y$   
(b) Solve  $(D - D' - 1)(D - D' - 2)z = e^{2x - y}$ .
- (a) Solve  $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$ ,  $u(0, y) = 8e^{-3y}$  by using the method of separation of variables

(b) Solve completely the equation  $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$ , representing the vibrations of a string of length  $l$ , fixed at both ends, given that  $y(0, t) = 0$ ;  $y(l, t) = 0$ ;  $y(x, 0) = f(x)$  and  $\partial y(x, 0) / \partial t = 0$ ,  $0 < x < l$ .

7. (a) Express the function  $f(x) = \begin{cases} 1 & \text{for } |x| \leq 1, \\ 0 & \text{for } |x| > 1, \end{cases}$  as a Fourier integral. Hence evaluate

$$\int_0^{\infty} \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda.$$

(b) Find the Fourier cosine transform of  $e^{-x^2}$ .

8. (a) Solve the integral equation  $\int_0^{\infty} f(x) \cos \alpha x dx = e^{-\alpha}$ .

(b) Using Parseval's identity, show that  $\int_0^{\infty} \frac{dx}{(x^2+1)^2} = \frac{\pi}{4}$ .

**CHE-2.1.2**  
**MODEL QUESTION PAPER**  
**II/IV B.Tech (CHEMICAL & BIOTECH) Degree Examination &**  
**II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**

**First semester**  
**CHEMICAL ENGINEERING**

**Physical Chemistry**  
*(Effective from the admitted batch of 2015-16)*

Time: 3 hours

Max. Marks: 70

Question no. ONE is compulsory and  
answer any FOUR from remaining questions.  
All question carry equal marks

1. Explain the following terms in short:
  - (a) Eutectic point
  - (b) EMF of a cell
  - (c) Surface tension
  - (d) Over-potential
  - (e) Electrode potential
  - (f) Critical constants
2.
  - (a) Explain briefly the liquefaction of gases.
  - (b) What is the difference between zeotropic and azeotropic mixtures.
3.
  - (a) Derive phase rule and explain each term involved in it.
  - (b) What is the difference between steam distillation and fractional distillation.
4.
  - (a) Write short note on intermolecular forces in liquids and their importance.
  - (b) Draw and explain the phase diagram of a one-component system.
5.
  - (a) Derive the Clausius – Clapeyron equation.
  - (b) How do you explain the effect of temperature on heat of reaction.
6.
  - (a) Derive and discuss the importance of Vant-Hoff's equation.
  - (b) Explain entropy and give an expression for entropy change accompanying a phase change.
7.
  - (a) Discuss in short the importance of calomel electrode.
  - (b) Explain the working of lead-acid battery.
8.
  - (a) Write a short note on industrial catalysts and their importance
  - (b) Discuss the kinetic equation involved in enzyme catalysis.

**CHE-2.1.3**  
**MODEL QUESTION PAPER**  
**II/IV B.Tech (CHEMICAL) Degree Examination &**  
**II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**First semester**  
**CHEMICAL ENGINEERING**  
**ORGANIC CHEMISTRY**  
*(Effective from the admitted batch of 2015-16)*

Time: 3 hours

Max. Marks: 70

**ANSWER QUESTION NO. 1 AND ANY OTHER FOUR QUESTIONS.**

*EACH QUESTION CARRIES 14 MARKS.*

1. Write a short note for each of the following (7×2=14)
  - a) Give Conformation structures for n-butane
  - b) What is Beyer's Strain Theory?
  - c) What is Saytzeff Rule?
  - d) What is vulcanisation of rubber?
  - e) Give reaction for halogenations of alkanes.
  - f) Give example for free radical polymerisation.
  - g) Give the reaction for converting carboxylic acid to amide
  
2.
  - a) Explain the methods of determining the molecular weight of an acid and a base 6 M
  - b) An organic compound on analysis gave the following results. 0.73 g of the compound gave 1.32 g of CO<sub>2</sub> and 0.6 g of H<sub>2</sub>O, 0.365 g of the compound gave 56 cc of N<sub>2</sub> at NTP. Calculate the percentage composition of the compound. 4 M
  - c) Give the confirmation tests for identifying carboxylic acid group and a primary amine group in an organic compound. 4 M
  
3.
  - a) Explain the concept of aromaticity with the structure of benzene 6 M
  - b) Give any two methods of preparation each for alkanes and alkenes 4 M
  - c) Explain Clemmensen and Wolffkishner reductions with examples 4 M
  
4.
  - a) Explain the industrial preparation and any three chemical reactions of ethyl alcohol 6 M
  - b) Explain HVZ reaction and Hoffmann Bromamide reactions 4 M
  - c) Discuss the mechanism of E<sub>2</sub> and E<sub>1</sub> elimination reactions 4 M
  
5.
  - a) Explain industrial method of preparation and any two chemical reactions of acetaldehyde and acetone 6 M
  - b) Explain Pinacol-Pinacolone rearrangement and Reimer-Tiemann reactions. 4 M
  - c) Give the structures of glucose and fructose and explain how you distinguish them chemically 4 M
  
6.
  - a) Explain industrial method of preparation of aniline and give reaction and mechanism for Hoffmann elimination 6 M
  - b) Give the tests for distinguishing 1<sup>o</sup>, 2<sup>o</sup> and 3<sup>o</sup> amines 4 M
  - c) Give the reactions for the preparation of sulphanilamide and write the mode of action of sulpha drugs 4 M

7. a) Give the method of preparation of melonic ester and acetoacetic ester and mention any two of their synthetic applications 6 M
- b) Differentiate Soaps and Detergents 4 M
- c) Give the reactions for the preparation and applications of Teflon and Nylon 6,6 4 M
8. a) Explain the sequence rules in R and S configurations with suitable examples 6 M
- b) What is a racemic mixture and how it is separated 4 M
- c) Explain the synthetic applications of LAH and OsO<sub>4</sub> with two examples each 4 M

**CHE-2.1.4**  
**MODEL QUESTION PAPER**  
**II/IV B.Tech (CHEMICAL) Degree Examination &**  
**II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**First semester**  
**CHEMICAL ENGINEERING**  
**MECHANICAL ENGINEERING**  
*(Effective from the admitted batch of 2015-16)*

Time: 3 hours

Max. Marks: 70

Question no. ONE is compulsory and  
answer any FOUR from remaining questions.  
All question carry equal marks

1. (a) Differentiate open system and closed system.  
(b) State the Zeroth law of thermodynamics.  
(c) Kelvin- Planck statement.  
(d) Isothermal efficiency of air compressor  
(e) Two differences between petrol engine and diesel engine.  
(f) Classification of steam turbines.  
(g) Define module and pitch of a gear.
2. (a)  $0.1 \text{ m}^3$  of an ideal gas at  $300\text{K}$  and  $1 \text{ bar}$  is compressed adiabatically to  $8 \text{ bar}$ . It is then cooled at constant volume and further expanded isothermally so as to reach the condition from where it started. Calculate:
  - (i) Pressure at the end of constant volume cooling.
  - (ii) Change in internal energy during constant volume process.
  - (iii) Net work done and heat transferred during the cycle. Assume  $c_p = 14.3 \text{ kJ/kg K}$  and  $c_v = 10.2 \text{ kJ/kg K}$ .(b) Derive the energy equation (m kg of fluid) for a steady flow system and also its application for steam or gas turbine.
3. (a) What are the characteristics of entropy? Prove that entropy is a property of a system.  
(b) The volume ratios of compression and expansion for a diesel engine as measured from an indicator diagram are  $15.3$  and  $7.5$  respectively. The pressure and temperature at the beginning of the compression are  $1 \text{ bar}$  and  $27^\circ\text{C}$ . Assuming an ideal engine, determine the mean effective pressure, the ratio of maximum pressure to mean effective pressure and cycle efficiency is  $0.8$  and the calorific value of oil  $42000 \text{ kJ/kg}$ .  
  
Assume for air:  $c_p = 1.005 \text{ kJ/kg K}$ ;  $c_v = 0.718 \text{ kJ/kg K}$ ,  $\gamma = 1.4$
4. (a) Discuss how the steam generators are classified. Give example of each classification.  
(b) With the help of neat sketch, explain Cochran boiler. What are its special features?
5. Derive an expression for force, work done, diagram efficiency, state efficiency and axial thrust in case of steam turbines.

6. (a) Discuss the various methods of cooling internal combustion engine giving merits and demerits of each.  
(b) Calculate the bore and stroke of a four stroke single cylinder diesel engine designed to the following particulars. Brake power=25kW when running on diesel fuel having composition by mass C=85% and H<sub>2</sub>=15% and lower calorific value of 41000kJ/kg. The fuel oil is burnt with 25% excess air and volumetric efficiency reckoned on atmosphere condition of 101.325kPa and 10<sup>0</sup>C is 80%. Assume mechanical efficiency of 0.9, indicated thermal efficiency of 0.35. Assume R=0.287 kJ/kg.K and bore to stroke ratio of 1:1.2. Assume speed of the engine 300rpm..
7. (a) The following particulars refer to a two stage single acting air compressor. Capacity 4.5 Cubic meters per minute measured under free conditions of 15° C and 1.01325 bar, delivery pressure 17.5bar, pressure during suction stroke 0.98bar, temperature at start of compression 30°C, clearance volume of low pressure cylinder is 6% of stroke volume. Index of compression and expansion 1.25 throughout. Speed 120rpm. Assuming that the inter cooler pressure is chosen such that theoretically the work is shared equally between the two cylinders determine (i) the indicated power (ii) the dimensions of the low pressure cylinder if the bore is equal to the stroke.
8. (a) What are the advantages and disadvantages of V-belt drive over flat belt drive?  
(b) A V-belt is to transmit 20kW from a 250mm pitch diameter sheave to a 900mm diameter pulley. The centre distance between the two shafts is 1000mm. The groove angle is 40° and the coefficient of friction for the belt and sheave is 0.2 and the coefficient of friction between the belt and flat pulley is 0.2. The cross-section of the belt is 40mm wide at the top, 20mm wide at the bottom and 25mm deep. The density of the belt is 1000kg/m<sup>3</sup> and the allowable tension per belt is 1000N. Find the number of belts required.

**CHE-2.1.5**  
**MODEL QUESTION PAPER**  
**II/IV B.Tech (CHEMICAL) Degree Examination &**  
**II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**First semester**  
**CHEMICAL ENGINEERING**  
**BASIC ELECTRICAL ENGINEERING**  
*(Effective from the admitted batch of 2015-16)*

Time: 3 hours

Max. Marks: 70

Question no. ONE is compulsory and  
answer any FOUR from remaining questions.

All question carry equal marks

1. (a) Define magneto motive force and reluctance.  
(b) What is meant by self induced EMF?  
(c) What is the significance of back EMF?  
(d) List the applications of D.C. Motor.  
(e) Define voltage regulation of the transformer.  
(f) Why the slots on the rotor of an induction motor are usually skewed?  
(g) Why the synchronous motors always run at synchronous speed?
2. (a) State and explain Faraday's laws of electromagnetic induction.  
(b) A cast steel magnet has an air gap of length 2mm and an iron path of 30cm. Find the number of ampere turns necessary to produce a flux density of  $1.2 \text{ wb/m}^2$ . The relative permeability of cast steel is 900. Neglect leakage and fringing.
3. (a) From the fundamentals, derive the E.M.F. equation of a D.C generator.  
(b) The armature of a 6-pole D.C Generator has a wave winding containing 650 conductors.  
Calculate
  - (i) The EMF when the flux per pole is 0.055wb and the speed is 300 rpm.
  - (ii) The speed at which the armature must be driven to generate an EMF of 550V if the flux per pole is reduced to 0.05 wb.
4. (a) Derive an expression for the torque of a D.C. motor.  
(b) A D.C series motor of resistance 1.5 ohm runs at 750 r.p.m. at 220 with a current of 20A. Find the speed at which it will run when connected in series with a 4.5 ohms resistance and taking the same current.
5. (a) Show that in an induction motor the rotor input : power developed : rotor copper losses : : 1 : (1-S) : S, where S is the fractional slip.  
(b) A three phase alternator having 12 poles is driven at a speed of 500 r.p.m. It supplies power to an 8-pole, 3- phase induction motor. If the slip of the motor at full-load is 4%, calculate the full load speed of the motor.
6. (a) Describe the method of calculating the regulation and efficiency of a single phase transformer by open and short circuit tests.  
(b) A 40 KVA, single phase transformer has 400 turns on the primary and 100 turns on the secondary. The primary is connected to 2000 V, 50 Hz supply. Determine
  - (i) The secondary voltage on open circuit
  - (ii) The maximum value of flux.
7. (a) Explain in detail, the comparison between single phase systems and three phase systems.  
(b) A balanced star connected load of  $(4 + j3) \Omega$  per phase is connected to a 400V, 3-phase, 50 Hz supply. Find the
  - (i) Line current
  - (ii) Power
  - (iii) Power factor



8. (a) What is voltage regulation? Discuss the synchronous impedance method for calculating voltage regulation.
- (b) A 3-phase star connected alternator is rated at 1500 kVA, 12000 V. the armature effective resistance and synchronous reactance are  $2 \Omega$  and  $35 \Omega$  respectively per phase. Calculate the percentage regulation for a load of 1200 Kw at power factor of 0.8 lagging.

**CHE-2.1.6**  
**MODEL QUESTION PAPER**  
**II/IV B.Tech (CHEMICAL) Degree Examination &**  
**II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**First semester**  
**CHEMICAL ENGINEERING**  
**STRENGTH OF MATERIALS**  
*(Effective from the admitted batch of 2015-16)*

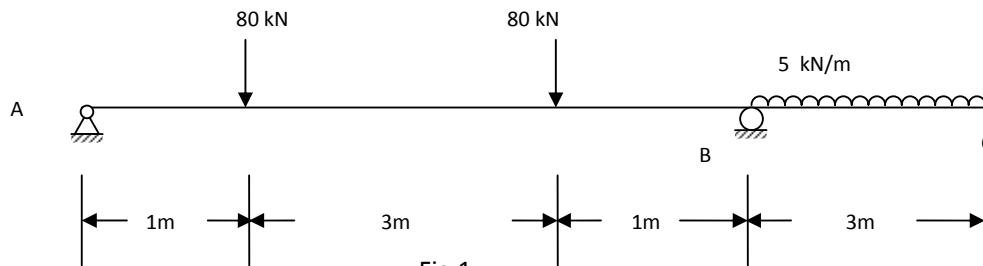
Time: 3 hours

Max. Marks: 70

Question no. ONE is compulsory and  
 answer any FOUR from remaining questions.  
 All question carry equal marks

1. Answer the following. 7 x 2 = 14 M
- What is yield stress of a material ? State its importance.
  - Distinguish between thin and thick cylinders with suitable examples.
  - What are the assumptions made in theory of simple bending?
  - Draw typical stress-strain curve for mild steel.
  - What are principal stresses? State their practical significance.
  - A steel tube of outside diameter 250mm and thickness 10mm is 2m long and carries a load of 1000kN. Find the changes in outside diameter if  $E = 200\text{GPa}$  and Poisson's ratio = 0.33.
  - On two perpendicular planes passing through a point there are complementary shear stress  $\pm 150\text{ N/mm}^2$ . The normal stress on these planes is zero. What is maximum principal stress at the point?

2. When a bar of certain material 50 mm diameter is subjected to an axial tensile force of 220 kN, there is an extension of 0.32 mm on a gauge length of 200 mm and the decrease in diameter is 0.024 mm. Calculate Young's modulus (E), Modulus of rigidity (N), Bulk Modulus (K) and Poisson's ratio.
3. Draw the shear force and bending moment diagrams for the beam shown in Fig.1.



4. (a) A vertical flag staff 4 m high is of square section throughout, the dimension being 4 cm by 4 cm at the top, tapering uniformly to 8 cm by 8 cm at the ground. A horizontal pull of 320 N is applied at the top along a diagonal of the section. Calculate the maximum bending stress in the staff.
- (b) Determine the ratio of maximum shear stress to average shear stress for a circular section of diameter D.
5. At a point in a strained material, there is tensile stress of  $80\text{N/mm}^2$  upon a horizontal plane and a compressive stress of  $40\text{ N/mm}^2$  upon a vertical plane. There is also shear stress of  $48\text{ N/mm}^2$  upon each of these planes. Determine the planes of maximum shear stress at the point. Determine also the resultant stresses on planes of maximum shear stress.
6. Derive the expression to calculate deflection in a spring subjected to axial load. Use the usual notations. Mention the assumptions made.

7. A solid aluminum shaft 1 m long and of 50 mm diameter is to be replaced by a hollow shaft of the same length and same outside diameter, so that the hollow shaft could carry the same torque and has the same angle of twist. What must be the inner diameter of the hollow shaft? Take modulus of rigidity for the aluminum as 28 GPa and that for steel as 85 GPa
8. (a) Derive expression for volumetric change in a thin cylinder subjected to an internal pressure  $p$ .  
(b) A thick cylindrical pipe of outside diameter 300 mm and internal diameter 200 mm is subjected to an internal fluid pressure of 14 MPa. Determine the maximum hoop stress in the section. Draw the variation of the hoop stress across the thickness of the pipe.

**CHE-2.2.1**  
**MODEL QUESTION PAPER**  
**II/IV B.Tech (CHEMICAL&BIOTECH)Degree Examination&**  
**II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Second semester**  
**CHEMICAL ENGINEERING**  
**FLUID MECHANICS**  
*(Effective from the admitted batch of 2015-16)*

Time: 3 hours

Max. Marks: 70

Question no. ONE is compulsory and  
 answer any FOUR from remaining questions.  
 All question carry equal marks

- |   |   |    |
|---|---|----|
| 1 | Write briefly about the following   |    |
|   | (a) Dimensional Homogeneity   | 2  |
|   | (b) Decanter  | 2  |
|   | (c) Hagen Poiseuille Equation   | 2  |
|   | (d) Drag coefficient  | 2  |
|   | (e) Mach Number   | 2  |
|   | (f) Gate Valve  | 2  |
|   | (g) NPSH  | 2  |
| 2 | (a) Derive the equation that expresses mathematically the condition of hydrostatic equilibrium?   | 7  |
|   | (b) A U tube manometer indicates a pressure drop of 250 mm water across an air filter. The air is at 27°C and 1 atm. What is the pressure drop in atm? What percentage of error is introduced if the density of air in the manometer leads is neglected?  | 7  |
| 3 | (a) Based on rheological properties of fluids classify fluids.  | 7  |
|   | (b) Write a note on Boundary Layer separation and Wake formation.   | 7  |
| 4 | (a) State and derive the Bernoulli's equation from Navier stokes equation   | 7  |
|   | (b) A water tank is 30 ft in diameter, and the normal depth is 25 ft. the outlet is a 4-in. horizontal pipe at the bottom. If this pipe is sheared off close to the tank, (a) what is the initial flow rate of water from the tank? (Neglect friction loss in the short stub of pipe.) (b) How long will it take for the tank to be empty? (c) Calculate the average flow rate and compare it with the initial flow rate.   | 7  |
| 5 | (a) Define fanning friction factor. How is it related to pressure drop $\Delta P_s$ and skin friction $h_{fs}$ ?  | 4  |
|   | (b) Water at 60°F is pumped from a reservoir to the top of a mountain through a 15 cm dia. pipe at an average velocity of 3.65 m/s. The pipe discharges into the atmosphere at a level 915 mt above the level in the reservoir. The pipeline itself is 1370 m long. If the overall efficiency of the pump and the motor driving it is 70 percent and the cost of electric energy to the motor is 5 rupees per kilowatt-hour, what is the hourly energy cost for pumping this water. | 10 |
| 6 | (a) Derive Ergun equation   | 7  |
|   | (b) Discuss about various types of fluidization. Explain the phenomenon of fluidization with a help of a neat sketch. State some of the applications of fluidization  | 7  |
| 7 | (a) Explain the construction and working of centrifugal pumps   | 7  |
|   | (b) A horizontal orifice meter ( $C_o = 0.62$ ) having a throat diameter of 25mm is set in a 7.5 cm i.d. pipe line. Water at 30°C is flowing through the line. A U-tube manometer containing mercury under water measures the pressure differential over the instrument. When the manometer reading is 45 cm, what is the flow rate?  | 7  |

8 Write Short notes on any two

- (a) Adiabatic frictional flow
- (b) Pipe fittings
- (c) Rotary Pumps

1  
4

**CHE-2.2.2**  
**Model Question Paper**  
**II/IV B. Tech (CHEMICAL) DEGREE EXAMINATION &**  
**II/VI B. TECH + M. TECH (DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**Second Semester**  
**Mechanical Operations**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 hours

Max. Marks: 70

Question No.1 is compulsory  
Answer any Four from the remaining  
All questions carry equal marks

1. Answer the following
  - a. Crushing efficiency
  - b. Comminution
  - c. Angle of rip
  - d. Drag coefficient
  - e. Work index
  - f. Free settling
  - g. Flocculation
  
2. a. Define specific surface of mixture?  
  
b. A crusher and grinder are connected to the same power drive. 2.7 Mg/hr of calcite passes through the crusher and grinder in succession. Screen analysis of the feed, product from the crusher, and the grinder product indicate surface areas of 2.9, 103 and 865 m<sup>2</sup>/kg, respectively. Estimate the power required by the drive to run the crusher-grinder assembly if the efficiency of the crusher 20% and that of grinder is 25%. Rittinger's number for calcite is 77.4 m<sup>2</sup>/kg.
  
3. a. what are the objectives of size reduction?  
  
b. Finely divided clay is used as a catalyst in petroleum industry. It has density of 1.2 gr/cc, and a sphericity of 0.5. the size analysis is:

Average diameter (cms)	0.025	0.018	0.013	0.009	0.004
Mass fraction (%)	8.8	17.8	29.3	19.4	24.7

Find the specific surface and number of particles.

4. a. What are the factors on which selection of filtration equipment and filter medium depends?  
b. Explain the working principle of a plate and frame filter press.
  
5. a. Describe an agitated vessel with all its shape factors i.e. relations of impeller diameter, baffle width etc with tank diameter. Give a neat sketch?

6. a. What is hinder settling of a particle?  
b. Drops of oil 15 microns I diameter are to be settled from their mixture in air. The specific gravity of oils is 0.85 and the air is at 20 C and 1 atm. Pressure. A minimum settling time of 1.8 min may be available. Determine the height of the settling chamber. ( $P_{\text{air}} = 1.2\text{gm/liter}$ ,  $\mu_{\text{air}} = 0.018 \text{ C.P}$ )
7. a. Explain the various sedimentation zones that are formed during settling of particles?  
b. With a neat sketch, explain the working of a thickness?
8. Write brief notes on any three of the following:
  - a. Trommel
  - b. Jaw crusher
  - c. Cyclone separator
  - d. Froth flotation

**CHE-2.2.3**  
**MODEL QUESTION PAPER**  
**2/4 B.TECH(IIInd sem)(CHEMICAL& BIOTECH) &**  
**2/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**SUB: CHEMICAL PROCESS CALCULATIONS**  
**(Effective from the admitted batch of 2015-16)**

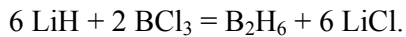
Time: 3 hrs

Marks:70

ANSWER QUESTION NO.1 AND ANY FOUR FROM THE REMAINING QUESTIONS.  
ALL QUESTIONS CARRY EQUAL MARKS.

- 1.(a). Define Limiting reactant and degree of completion.
- (b). Briefly discuss about the reference substance plots.
- (c). State the law of Dalton and Avogadro principle.
- (d). Define percentage saturation and Dew point.
- (e). Explain about recycle and purge streams.
- (f). State Kopp's rule and Trouton's rule.
- (g). State the laws of thermochemistry.

2.Diborane, B<sub>2</sub>H<sub>6</sub> can be made by using Lithium bromide(LiH).



If you mix 200 kg of LiH with 1000 kg of BCl<sub>3</sub>, you recover 45 kg of B<sub>2</sub>H<sub>6</sub>. Determine,(i). Limiting reactant, (ii).Percent excess reactant, (iii). Percent conversion of LiH to B<sub>2</sub>H<sub>6</sub>, (iv).Degree of completion of the reaction, (v).Yield of B<sub>2</sub>H<sub>6</sub> based on LiH charged(kg/kg). Atomic weights of B=10.81, Li=6.94

3.A producer gas has the following composition by volume:

CO=23%, CO<sub>2</sub>=4.4%, O<sub>2</sub>=2.6%, N<sub>2</sub>=70%.

- (i) Calculate the cubic feet of gas at 70<sup>0</sup>F and 750 mmHg pressure per pound of carbon present.
- (ii) Calculate the volume of air at the conditions of part 'a' required for the combustion of 100 cuft of the gas at the same conditions if it is desired that the total oxygen present before combustion shall be 20% in excess of that theoretically required.
- (iii) (iii).Calculate the percentage composition by volume of the gases leaving the burner of part 'b' assuming complete combustion.
- (iv) (iv).Calculate the volume of the gases leaving the combustion in parts b and c at a temperature of 600<sup>0</sup>F and a pressure of 750 mmHg per 100 cuft of gas burned.



4. A furnace is to be designed to burn coke at the rate of 200 lb per hour. The coke has the following composition. Carbon = 89.1% and Ash = 10.9%. The grate efficiency of the furnace is such that 90% of the carbon present in the coke charged is burned. Air is supplied in 30% excess of that required for the complete combustion of all the carbon charged. It may be assumed that 97% of the carbon burned is oxidized to the dioxide, the remainder forming monoxide.

(i). Calculate the composition by volume of the flue gases leaving the furnace.

(ii). If the flue gases leave the furnace at a temperature of 550<sup>0</sup>F and a pressure of 743 mmHg, calculate the rate of flow gases in cubic feet per minute for which the stack must be designed.

5. A continuous drier is operated under such conditions that 250 lb of water are removed per hour from the stock being dried. The air enters the drier at 175<sup>0</sup>F and a pressure of 765 mmHg. The dew point of the air is 40<sup>0</sup>F. The air emerges from the drier at 95<sup>0</sup>F, a pressure of 755 mmHg and at 90% relative humidity. (a). How many cubic feet of the air must be supplied per hour? (b). How many cubic feet of the air emerge from the drier per hour? V.P. of water at 40 and 95<sup>0</sup>F are 6.29 and 42.18 mmHg respectively.

6. The spent acid from a nitrating process contains 33% H<sub>2</sub>SO<sub>4</sub>, 36% HNO<sub>3</sub> and 31% H<sub>2</sub>O by weight. This acid is to be strengthened by the addition of concentrated sulfuric acid containing 95% H<sub>2</sub>SO<sub>4</sub> and concentrated nitric acid containing 78% HNO<sub>3</sub>. The strengthened mixed acid is to contain 40% H<sub>2</sub>SO<sub>4</sub> and 43% HNO<sub>3</sub>. Calculate the quantities of spent and concentrated acids that should be mixed together to yield 1500 lb of the desired acid.

7. The following reaction is carried out at a temperature of 450<sup>0</sup>C. Calculate the heat of reaction at this temperature.  $N_2(g) + 3H_2(g) = 2NH_3$ , Std heat of formation of NH<sub>3</sub>(g) = -11.04 Kcal/gmol. Heat capacities in cal/mol.K and T in <sup>0</sup>K. N<sub>2</sub>(g) : C<sub>p</sub> = 6.457 + 1.389 × 10<sup>-3</sup>T - 0.069 × 10<sup>-6</sup>T<sup>2</sup> NH<sub>3</sub>(g): C<sub>p</sub> = 5.92 + 8.963 × 10<sup>-3</sup>T - 1.764 × 10<sup>-6</sup>T<sup>2</sup> H<sub>2</sub>(g): C<sub>p</sub> = 6.946 + 0.196 × 10<sup>-3</sup>T - 0.4757 × 10<sup>-6</sup>T<sup>2</sup>

8. Calculate the theoretical flame temperature of a gas containing 20%CO, 80%N<sub>2</sub> when burned with 150% excess air, both gas and air being at 25<sup>0</sup>C.

Data: Heat of formation in cal/g mol at 25<sup>0</sup>C : CO<sub>2</sub> = -94,052, CO = -26,412

Avg. specific heat in cal/g mol K : CO<sub>2</sub> = 12.10, O<sub>2</sub> = 7.9, N<sub>2</sub> = 7.55

**CHE-2.2.4**  
**(Model Paper)**  
**2/4 B.TECH(CHEMICAL) IIND SMESTER&**  
**2/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering Thermodynamics – I**  
**(Effective from the admitted batch of 2015-16)**

Answer to Q.No.1 is compulsory. Answer any FOUR from the remaining questions. All questions carry equal marks.

Time: 3 hours

Max. Marks: 70

- 
1. Answer briefly to the following (7x2 = 14)
- Zeroeth law
  - Reversible process
  - Extensive properties
  - Internal energy
  - Sign convention for work
  - Cyclic process
  - Point function
2. A steel casting weighing 2 kg has an initial temperature of 773 K. 40 kg of water initially at 298 K is contained in a perfectly insulated steel tank weighing 5 kg. The casting is immersed in the water and the system is allowed to come to equilibrium. What is its final temperature? Ignore effects of expansion or contraction, and assume constant specific heats of  $4.18 \text{ kJ kg}^{-1} \text{ K}^{-1}$  for water and  $0.5 \text{ kJ kg}^{-1} \text{ K}^{-1}$  for steel.
3. Water at 366 K is pumped from a storage tank at the rate of  $0.00315 \text{ m}^3/\text{s}$ . The motor for the pump supplies work at the rate of 1.5 kW. The water goes through a heat exchanger, giving up heat at the rate of 700 kW, and is delivered to a second storage tank at an elevation 15 m above the first tank. What is the enthalpy change of the water?
4. One mole of air, initially at  $150^\circ\text{C}$  and 8 bar, undergoes the following mechanically reversible changes. It expands isothermally to a pressure such that when it is cooled at constant volume to  $50^\circ\text{C}$  its final pressure is 3 bar. Assuming air is an ideal gas for which  $C_p = (7/2)R$  and  $C_v = (5/2)R$ . Calculate W, Q,  $\Delta U$  and  $\Delta H$ .
5. For steady flow through a heat exchanger at approximately atmospheric pressure, what is the final temperature when 800 kJ is added to 10 mol of ethylene initially at  $200^\circ\text{C}$ ?  
 $C_p/R = 1.424 + 14.394 \times 10^{-3} T - 4.392 \times 10^{-6} T^2$
6. One mole of an ideal gas is compressed isothermally but irreversibly at  $130^\circ\text{C}$  from 2.5 bar to 6.5 bar in a piston/cylinder device. The work required is 30% greater than the work of reversible, isothermal compression. The heat transferred from the gas during compression flows to a heat reservoir at  $25^\circ\text{C}$ . Take  $C_p = 3.5R$ . Calculate the entropy changes of the gas, the heat reservoir, and  $\Delta S_{\text{total}}$ .
7. (a) Write down the fundamental property relations for a homogeneous fluid of constant composition. From these equations obtain Maxwell's equations. (2+4)  
(b) Starting from the equation  $dG = V dP - S dT$ , derive an equation that relates  $G^R$  with Z. (4 marks)
8. Write short notes on: (5+5+4)
- Linde liquefaction process
  - Rankine cycle
  - Entropy of universe

**CHE-2.2.6**  
**MODEL PAPER**  
**II/IV B.Tech II Semester (Chemical and Biotechnology)&**  
**II/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**ENVIRONMENTAL STUDIES**  
**(Effective from the admitted batch of 2015-16)**

Time:3 h

Max. Marks:70

Answer any FIVE questions  
First question is compulsory

1. Write short notes on:
  - a) Environmental studies
  - b) Ecosystem
  - c) Natural resources
  - d) Erosion
  - e) EIA
  - f) Desertification
  - g) Water logging
2. a) What are the impacts of construction of large dams? What are the possible measures to reduce impact? (7 M)  
b) Explain the structure and function of aquatic ecosystem. (7 M)
3. What do you understand by the term biodiversity? Write briefly about the different kinds of diversity in organism. (14 M)
4. a) What is ozone layer depletion? State its causes and effects in environment. (7 M)  
b) Explain the value of Biodiversity. (7 M)
5. Write short notes on: (14 M)
  - a) Cloud seeding
  - b) Watershed management
  - c) Solid waste management.
  - d) Global warming
6. a) Discuss the effects of urbanization and industrialization in the quality of environment. (7 M)  
b) What are the major problems faced in rehabilitation and resettlement of people? (7 M)
7. a) Write short notes on Earth Summit -1992. (7 M)  
b) Write the causes, effects and control measures of air pollution. (7 M)
8. Explain: (14 M)
  - a) Narmada bachao andolan
  - b) Rain water harvesting
  - c) Acid rain

**CHE-3.1.1**  
**III/IV B.Tech Degree Examination(Chemical)&**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**First Semester**  
**MASS TRANSFER – 1**  
**MODEL QUESTION PAPER**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 hours

Max. Marks:70

Answer questions No. 1 and any other FOUR questions.

All questions carry equal marks.

- 1) Explain the following 7X2 =14
  - a) Fick's law and its limitations
  - b) Significance of Schmidt number
  - c) Absorption factor and its significance
  - d) Relative volatility
  - e) Gas film controlling
  - f) Flash vaporization
  - g) Wet bulb temperature
- 2) a) Obtain an expression for the steady state equimolar counter diffusion of two gases. (7)  
b) Discuss the analogy between momentum, heat and mass transfer (7)
- 3) a) Present different theories proposed to explain turbulent mass transfer (7)  
b) Benzene is stored in a tank of diameter 10 m and open at the top. A stagnant air film 12 mm thick is covering the surface liquid beyond which benzene is absent. The atmospheric temperature and pressure are 25<sup>0</sup> C and 1 atm, respectively. Estimate the rate of loss of benzene. The vapour pressure of benzene at 25<sup>0</sup> C is 150 mm Hg and the diffusivity in air is 0.02 m<sup>2</sup>/s. (7)
- 4) a) Derive the relationship between individual and overall mass transfer coefficients (7)  
b) Explain the material balances in steady state co- current cascade processes (7)
- 5) a) With the help of a neat sketch, explain the functioning of agitated vessels for gas-liquid mass transfer operations. Discuss the merits and demerits of it. (7)  
b) Describe the Sieve tray column for distillation operation (7)
- 6) A packed tower is designed to recover 98% CO<sub>2</sub> from a gas mixture containing 10% CO<sub>2</sub> and 90% air using water. A relation  $Y = 14 X$  can be used for equilibrium conditions, where  $Y = \text{kg CO}_2/\text{kg dry air}$  and  $X = \text{kg CO}_2/\text{kg water}$ . The water to gas rate is kept 30% more than the minimum value. Find the height of the tower if  $(\text{HTU})_{\text{OG}}$  is 1 m. (14)
- 7) Explain the step wise graphical design procedure for estimation of number of theoretical stages in a fractionating column. (14)
- 8) a) Derive an expression for adiabatic saturation temperature. (7)  
b) Differentiate between azeotropic and Extractive distillation (7)

**CHE-3.1.2**  
**III/ IV B.Tech. DEGREE EXAMINATION(CHEMICAL)&**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**FIRST SEMISTER**  
**HEAT TRANSFER**  
**(Model Question Paper)**

**(Effective from the admitted Batch of 2015-2016)**

*Time: 3 hours*

*Maximum: 70 Marks*

ANSWER QUESTION No. 1 AND ANY FOUR FROM THE REMAINING QUESTIONS.  
All questions carry equal marks

1. WRITE BRIEF ANSWERS FOR THE FOLLOWING: (7x2=14)
- (a) Critical radius of insulation.
  - (b) What is thermal resistance?
  - (c) Define Capacity and Economy in evaporation.
  - (d) Multipass heat exchangers
  - (e) Effectiveness of the heat exchanger.
  - (f) Duhring's rule
  - (g) Emissivity.
2. (a) A plane wall is constructed of a material having a thermal conductivity that varies as the square of the temperature given by  $K = K_0(1 + \beta T^2)$ . Derive an expression for steady state heat conduction. (7)
- (b) A Steel pipe 25mm i.d.and 33mm o.d and insulated with rock wool carries steam at 178 °C. If the surrounding air temperature is 21 °C, calculate the rate of heat loss from one meter length of pipe. The thickness of insulation is 38mm.The thermal conductivity of steel and rock wool are 38.66 and 0.15 kcal/hr-m °C respectively. The inside and outside heat transfer coefficients are 4882 and 9.77 kcal/hr m<sup>2</sup>°C respectively. Contact resistance between the pipe and insulation may be neglected. (7)
3. (a) What is convection? What are the various correlations used to calculate film coefficient in forced convection for without phase change. (6)
- (b) Calculate the heat transfer coefficient for fluid flowing through a tube having inside diameter 40 mm at a rate of 5500 kg/hr. Assume that fluid is being heated. (8)

Data: properties of fluid at mean bulk temperature:

Visosity of flowing fluid=0.004 (N.s)/m<sup>2</sup>

Density of flowing fluid= 1.07 g/cm<sup>3</sup>

specific heat of flowing fluid= 2.72 kJ/ (kg.K)

Thermal conductivity of flowing fluid= 0.256 W/(m.K)

Make use of Dittus-Boelter equation.

4. a) Derive the equation for LMTD for a counter current heat exchanger. (6)
- b) Water enters a two-fluid heat exchanger at  $55^{\circ}\text{C}$  and leaves at  $85^{\circ}\text{C}$ . Hot gases enter at  $305^{\circ}\text{C}$  and leaves at  $160^{\circ}\text{C}$ . If the total heat transfer area is  $500\text{ m}^2$  and the overall heat transfer coefficient is  $600\text{ kcal/hr m}^2\text{ }^{\circ}\text{C}$ , determine the total heat transferred per hour for
- (i) Parallel flow, and (8)
- (ii) Countercurrent flow of the fluids.

5. a) Explain the significance of Boling point Elevation (BPE) in Evaporation. (4)
- b) For a single effect evaporator calculate the amount of steam, surface area required for concentrating the solution of caustic soda from 28% W of solids to 40% W solids. The feed rate is 25000 kg/hr and its temperature is  $60^{\circ}\text{C}$ . The absolute pressure in the evaporator is  $0.2\text{ kg/cm}^2$  (boiling point  $60^{\circ}\text{C}$ ). Saturated steam at  $1.4\text{ kg/cm}^2$  ( $108.7^{\circ}\text{C}$ ) is to be used as heating medium. The elevation in boiling point is  $25^{\circ}\text{C}$ . For this the overall heat transfer coefficient is  $670\text{ kcal/hr m}^2\text{ }^{\circ}\text{C}$ . (10)

The enthalpy data for various streams are as follows:

Vapour at  $0.2\text{ kg/cm}^2 = 623\text{ kcal/kg}$

28% NaOH at  $60^{\circ}\text{C} = 50\text{ kcal/kg}$

40% NaOH at  $85^{\circ}\text{C} = 90\text{ kcal/kg}$

Latent heat of steam at  $1.4\text{kg/cm}^2 = 534\text{ kcal/kg}$ .

6. a) How does pool boiling differ from nucleate boiling? Explain and Draw the boiling point curve and identify the burnout point on the curve. (7)
- b) Explain the concepts of Dropwise and film type condensation in heat transfer to fluids with phase change. (7)
7. (a) What is a gray body? How does it differ from a black body? (4)
- (b) Obtain the rate of heat loss from a thermo flask if the polished silvered surfaces have an emissivity of 0.05, the liquid in the flask is at  $95^{\circ}\text{C}$  and the casing is at  $20^{\circ}\text{C}$  Calculate the loss if both surfaces were black. Stefan Boltzmann constant=  $4.875 \times 10^{-8}\text{ kcal/hr m}^2\text{ k}^4$ . (10)
8. Write short notes on: (7+7)
- (a) State the merits and demerits of multiple effect evaporators and their feeding methods over a single effect evaporator with a neat sketch. (7)
- (b) Derive an expression for steady state heat conduction through a multilayered cylinder. (7)

**CHE-3.1.3**  
**MODEL QUESTION PAPER**  
**III/IV B.TECH CHEMICAL ENGINEERING (FIRST SEMESTER)&**  
**III/VI(B.TECH+M.TECH DOUBKE DEGREE COURSE)**  
**CHE-321 CHEMICAL ENGINEERING THERMODYNAMICS-II**  
**(Effective from the admitted batch of 2015-16)**

Time: 3Hrs

Marks: 70

Question no.1 compulsory and answer four questions from the remaining.

1. Define the following: (7X2= 14M)

- a) Chemical Potential
- b) Henry's Law
- c) Fugacity
- d) VLLE.
- e) Van't Hoff's equation
- f) Degrees of freedom for reacting systems.
- g) Thermodynamic consistency.

2. Estimate  $\phi_1$  and  $\phi_2$  for an equimolar mixture of methyl ethyl ketone (1) / toluene (2) at 50°C and 25kPa set all  $k_{ij} = 0$  the required data are as follows (14M)

Species	Tc in K	Pc in bar	Vc in cm <sup>3</sup> /mol	Zc	$\omega$
1	535.5	41.5	267	0.249	0.363
2	591.8	41.1	316	0.264	0.262

3. For the system Methanol (1) /Methyl acetate (2) in VLE obeying Modified Raoult's law , the Antoine equations are given below:

$$\ln P_1^{sat} = 16.59158 - \frac{3643.31}{T-33.424}$$

$$\ln P_2^{sat} = 14.25326 - \frac{2665.54}{T-53.424}$$

Where T is in °K and P is kPa.

The Activity coefficients are provided as

$$\ln \gamma_1 = Ax_2^2 \quad \ln \gamma_2 = Ax_1^2 \quad A = 2.771 - 0.00523T$$

Calculate

- a) DEW P and  $x_i$  for  $y_1=0.55$  and  $T = 318.15$  K
- b) DEW T and  $x_i$  for  $y_1=0.40$  and  $P= 101.33$  kPa. (14M)

4. From the following compressibility data for CO<sub>2</sub> at 150°C obtain the value of fugacity and fugacity coefficient corresponding to a pressure of 400 bar and compare the results using second virial coefficients Correlation (14M)

P(bar)	10	20	40	60	80	100	200	300	400	500
Z	0.985	0.970	0.942	0.913	0.885	0.865	0.765	0.762	0.824	0.910

For Carbondioxide

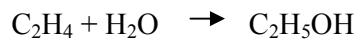
Tc in K	Pc in bar	$\omega$
304.2	73.83	0.224

5. The following VLE data for the system benzene (1)/ n-Heptane(2) at 60 °C assuming that the Margule's equation represents the VLE data for this system, determine Margule's parameters. Given that  $p_1^{\text{sat}} = 52.44$  and  $p_2^{\text{sat}} = 28.11$  kPa. (14M)

P (KPa)	31.68	35.36	42.33	44.4	49.16	51.62
$x_1$	0.081	0.180	0.404	0.479	0.713	0.907
$y_1$	0.187	0.340	0.578	0.642	0.796	0.922

6. The azeotrope of ethanol – benzene system has a composition 44.8 %(mol) ethanol with a boiling point of 341.4K at 101.3kPa. At this temperature the vapour pressure of benzene is 68.9kPa and the vapour pressure of ethanol is 67.4kPa. What are the activity coefficients in a solution containing 20% alcohol. (Assume Van Laar's equation) (14M)

7. Calculate the equilibrium constant for the vapour-phase hydration of ethylene to ethanol at 550 K. (14M)



The following data are available:

Components	$\Delta H_f^0, 298 \times 10^{-3} \text{ J/mol}$	$\Delta G_f^0, 298 \times 10^{-3} \text{ J/mol}$	$C_p \text{ J/mol k}$
Ethylene	52.51	68.46	$11.886 + 120.12 \times 10^{-3} T - 36.649 \times 10^{-6} T^2$
Water	-241.818	-228.57	$30.475 + 9.652 \times 10^{-3} T - 1.189 \times 10^{-6} T^2$
Ethanol	-235.1	-168.49	$29.358 + 166.9 \times 10^{-3} T - 50.09 \times 10^{-6} T^2$

8. a) Explain the equilibrium and stability conditions involved in phase equilibrium for the species in mixture. (7M)

b) Derive the relation between equilibrium constant and standard Gibbs free energy change. (7M)



**CHE-3.1.4**  
**Model Question Paper**  
**III/IV B. Tech DEGREE EXAMINATION &**  
**III/VI B.TECH+M.TECH (DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**Organic chemical technology**  
**(Effective from the admitted batch of 2015-16)**

Answer question No. 1(Compulsory) and  
Answer any FOUR questions from the remaining.  
All questions carry equal marks.

1. Explain the following Briefly: (2 X 7 = 14)
  - (a) Detergents
  - (b) HDPE
  - (c) Classification of rubbers
  - (d) Reforming
  - (e) Dextrin
  - (f) Synthetic fibers
  - (g) Hydrogenation of oils
  
2. (a) What is the composition of crude oil? (5)  
(b) Explain the distillation of crude petroleum with a neat sketch (9)
  
3. Explain in detail low and high temperature carbonization of coal. (14)
  
4. With a neat flow diagram, describe the continuous process for production of fatty acids, soaps and glycerin. (14)
  
5. Differentiate clearly between paints and varnishes. What are their applications?  
With a neat flow diagram, describe the operations required for mixing paint. (14)
  
6. (a) What are the main differences between sulfate and sulfite process for the production of pulp? (7)  
(b) Explain the production of paper by wet process with a neat flow sheet? (7)
  
7. Classify rubbers and Explain the manufacture of styrene butadiene rubber (SBR) with a neat flow diagram. (14)
  
8. (a) What is polymerization? (7)  
(b) Explain the production of polyester with a neat flow diagram. (7)

**CHE-3.1.5**  
**Model Question Paper**  
**III/IV B. Tech DEGREE EXAMINATION &**  
**III/VI B.TECH+M.TECH (DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**Materials Science and Engineering**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 hours

Max. Marks: 70

Question No.1 is compulsory  
Answer any Four from the remaining  
All questions carry equal marks

1. Answer the following
  - a. Lattice coordinates
  - b. Differentiate between atomic structure and crystal structure
  - c. Phase Rule
  - d. Eutectic point
  - e. Burger's circuit
  - f. Engineering Strain
  - g. Poisons ratio
2.
  - a. What are Miller indices? How they are determined? (4)
  - b. Calculate the atomic density (number of atoms per unit area) in (111), (110) and (100) planes of copper (FCC) with the lattice parameter of  $3.61^{\circ}$  A. Can you pack atoms are closely than in (111) plane?
3.
  - a. Give the characteristics of Covalent bond and how it is different from metallic bond
  - b. sketch a two dimensional space lattice, indicate neatly a primitive cell, double cell, and triple cell?
  - c. Give the properties of Orthorhombic crystal with neat sketch?
4.
  - a. What is meant by crystal imperfections? Explain the role of dislocation in determining crystal properties?
  - b. The fraction of vacant sites in sodium chloride lattice at 30 degree centigrade is  $3.8 \times 10^{-15}$ . Calculate the energy required to form a mole of Schottky's defects
5.
  - a. Two metals A and B are miscible both in the solid and liquid states. Draw the phase diagram and label all the fields. Show the tie line in the diagram and give the significance of the Tie-line. Derive the rule relating the equilibrium compositions of the solid and liquid at any given temperature?
6.
  - a. Differentiate between homogeneous and heterogeneous nucleation?
  - b. Obtain the composition of the micro constituents of pre-ectectoid phases just below eutectoid temperature for 0.4% and 1.2% carbon steels. What are the relative amounts of Ferrite and carbide in a pearlite mixture?
7.
  - a. Define composite material? How do you classify them and explain with suitable examples?
  - b. Distinguish between elastic and plastic deformation
8. Explain the following
  - a. Line imperfections
  - b. Critical Resolved shear stress
  - c. Factors to increase fatigue resistance

**CHE-3.1.6 A**  
**III/IV B.Tech DEGREE EXAMINATION &**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**Elective -1: PAPER TECHNOLOGY**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 Hours

Max.Marks: 70

*Question No.1 is compulsory.*  
*Answer any Four from the remaining.*  
*All questions carry equal marks.*

1. Explain the following : (7x2 = 14)
  - a) Wrapping paper
  - b) Synthetic fibers
  - c) Screening of chips
  - d) Bagasse
  - e) Semichemical pulping
  - f) Beating and refining
  - g) Sizing and loading
2. a) Define a paper. Describe the types of paper products. (7)  
b) Describe the method of production of paper with flow sheet. (7)
3. a) Explain the development of paper industry in India (7)  
b) List out the different types of papers boards manufactured in industry today (7)
4. a) Describe the feed preparation of wood based material for the production of pulp. (7)  
b) Describe the mechanical pulping process. (7)
5. a) Distinguish clearly between hard woods and soft woods. (7)  
b) What is cellulose, semi cellulose and lignin? Discuss their role in the manufacture of paper (7)
6. a) Explain the role of  $\text{Na}_2\text{S}$  in Kraft pulping. (7)  
b) Explain with a neat flow diagram recovery of cooling chemicals from Kraft spent liquor. (7)
7. a) Explain the operations involved in wood preparation. (7)  
b) What is ground wood pulping? Explain functions for warren chain grinder with a neat diagram. (7)
8. What is stock preparation? Explain the beating and refining process with a suitable diagram. (14)

**CHE-3.1.6 B**  
**III/IV B.Tech DEGREE EXAMINATION &**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**Elective -1: FERTILIZER TECHNOLOGY**  
**(Effective from the admitted batch of 2015-16)**

TIME:3hr

MARKS: 70

Note: Each question carries equal marks.

Q.No 1 is compulsory

Answer any Four questions from remaining

1. Answer the following
  - a) Grade of a fertilizer
  - b) Different forms of phosphate
  - c) Uses of ammonia
  - d) SSP
  - e) Handling of Ammonium nitrate
  - f) Merseberg process
  - g) Urea
2. Explain the role of all nutrients in plant growth.
3. Explain the manufacture of ammonia from natural gas using steam reforming process.
4. Discuss the method of manufacturing of Phosphoric acid by dihydrate process and highlight the merits and demerits of it.
5. Describe the production of CAN with a neat flow diagram.
6. Discuss in detail about manufacture of sulphuric acid by DCDA process.
7. Explain different ways of ammonium sulphate manufacture.
8. Write short notes on the following
  - a) Nitrophosphates
  - b) DAP

**CHE-3.1.6 C**  
**III/IV B.Tech DEGREE EXAMINATION &**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**Elective -1: PETROCHEMICALS**  
**(Effective from the admitted batch of 2015-16)**

Answer question No. 1 (Compulsory) and  
Answer any FOUR questions from the remaining.  
All questions carry equal marks.

1. Explain the following Briefly: (2 X 7 = 14)
  - (a) Feed stocks
  - (b) Acetaldehyde
  - (c) Methods of Polymerization
  - (d) Caprolactum
  - (e) Dehydrogenation
  - (f) Polyester
  - (g) Detergents
  
2. Discuss briefly, the theories of origin, Formation and Occurrence of crude Petroleum. (14)
  
3. What is Vinyl acetate Monomer? Describe the manufacturing process with a neat flow diagram and mention the chemical reactions? (14)
  
4. With a neat flow diagram, describe the production of Isopropyl Alcohol through sulphuric acid hydration and direct hydration? (14)
  
5. Explain about the polymer structure? With the help of a schematic flow diagram, Explain the process for the production of Low Density Polyethylene. (14)
  
6. What are Petroleum Aromatics? Discuss the manufacturing process of Benzoic Acid and Phthalic Anhydride? (14)
  
7. Explain the Synthesis of Polyurethane with a neat flow diagram. What are the significant properties of polyurethane, which determines its applications? (14)
  
8. Give various types of detergents and describe the production of keryl benzene sulfonate? (14)

**CHE-3.1.6 D**  
**Model Question Paper**  
**III/IV B. Tech DEGREE EXAMINATION&**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**Elective – I: Ceramic Raw Materials**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 hours

Max. Marks: 70

Question No.1 is compulsory  
Answer any Four from the remaining  
All questions carry equal marks

1. Answer the following
  - a. Assimilation
  - b. Distinguish between cleavage and fracture
  - c. Atterberg limits
  - d. Pleochroism
  - e. Fluxes
  - f. Dolomite chemical composition and use
  - g. Epigenetic mineral deposit
2.
  - a. Define igneous rock? Briefly given an account of Bowen's reaction principle
  - b. What is mineral deposit? What are the different characteristic features of igneous rocks?
3. Define weathering? Discuss in detail about the different types of weathering causing for the formation of sedimentary rocks? Add a note on the importance of sedimentary rocks in the ceramic industry?
4. What is clay? List out and discuss briefly about the different physical properties of clays?
5. Discuss briefly about the polymorphic modification of silica? Add a note on the physical properties of silica?
6. Explain the beneficiation technique of clay with suitable sketches? Add a note on the general properties of clays?
7. Describe the following w.r.t their geology, properties, chemical composition, occurrence and uses in ceramic industry?
  - a. Bauxite (b). Nitrides (c). Rutile
8. Answer any three of the following
  - a. China clay
  - b. Polymorphs of sillimanite and their occurrence and uses in ceramic industry
  - c. Rock cycle
  - d. Illite group of minerals

**CHE-3.2.1**  
**III/IV B.Tech Degree Examination &**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**Second Semester**  
**Model paper**  
**MASS TRANSFER-II**  
*(effective from the admitted batch 2015-2016)*

1. Explain the following

- (A) Define extraction
- (B) Leaching
- (C) Adsorption
- (D) Mass transfer Coefficient
- (E) Reflux ratio
- (F) Dialysis
- (G) Reverse Osmosis

2. (A) Vapor pressures of Benzene and Toluene mixture are given in the table below. Assuming that this mixture follow Raoult's law, Calculate and plot the boiling point diagram and the equilibrium composition curve. The total pressure is 1 atm.

Temp (°C)	P <sup>0</sup> <sub>Ben</sub> (mm Hg)	P <sup>0</sup> <sub>Tol</sub> (mm Hg)
80.1	760	0
85	877	345
90	1016	405
100	1344	557
110	1748	743
110.6	1800	760

(B) What do you understand by quantity 'q'? Derive q-line equation for introduction of feed in the distillation column.

3. (A) Experiments on decolorisation of oil yielded the equilibrium relationship as  $y = 0.5x^{0.5}$ , where  $y$  = gm color removed/gm adsorbent and  $x$  = color in oil, gm color/1000 gm color free oil. 100 kg oil containing 1 part of color to 3 parts of oil is agitated with 25kg of adsorbent. Calculate the percentage color removed if all 25 kg of adsorbent is used in one step.

4. (A) Derive the equation for the rate of adsorption in a fixed bed and explain the concept of degree of saturation.

(B) What is an azeotrope? With suitable example explain the advantages, disadvantages and industrial application of azeotropic distillation.

5. (A) Qualitatively, explain the apparent adsorption of solute from solution

(B) Prove that for cross current two-stage treatment of liquid solutions by contact filtration, when the adsorption isotherm is linear, the least total adsorbent results if the amounts used in each stage are equal.

6. (A) What is reflux ratio? Derive Fenske Equation

(B) The charge to a simple batch still consists of an equi molar binary mixture of A and B. For values of  $\alpha_{AB}$  of 2, 5, 10, 100, and 1000, and 50% vaporization of A, determine the percent vaporization of B and the mole fraction of B in the total distillate.

7. (A) With neat diagram explain the theory of wet-bulb temperature and derive the equation for wet-bulb temperature determination.

(B) In a mixture of benzene vapor (A) and nitrogen gas (B) at a total pressure of 800 mm Hg and a temperature of  $60^{\circ}\text{C}$ , the partial pressure of benzene is 100 mmHg. Express the benzene fraction in terms of mole fraction, volume fraction, molar absolute humidity and mass absolute humidity.

8. (A) Explain the theory of adiabatic saturation temperature and derive the equation for adiabatic saturation temperature determination.

(B) The temperature of air in a room is  $40.2^{\circ}\text{C}$  and the total pressure is 101.325 kPa absolute. The air contains water vapor with a partial pressure of 3.74 kPa. The vapor pressure of water at this temperature is 7.415 kPa. Calculate the humidity, the saturation humidity, percentage humidity and the percentage relative humidity.



**CHE-3.2.2**  
**III/IV B.Tech Degree Examination &**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**Second Semester**  
**Model paper**  
**Chemical Reaction Engineering-I**  
*(effective from the admitted batch 2015-2016)*

Time: 3 hours.

Max. Marks: 70

Answer the following questions

Question No. 1 is compulsory and Answer any 4 from the remaining

1. Write briefly about the following: (7 x 2 = 14)
  - (a) Law of mass action
  - (b) Recycle reactors
  - (c) Heterogeneous reactions
  - (d) Arrhenius theory
  - (e) Pseudo first order
  - (f) Space time and residence time
  - (g) Non elementary reactions
  
2.
  - (a) Explain the salient features of the three theories that are proposed to explain the temperature dependence of a reaction. (7)
  - (b) Derive the Michelis and Menten rate expression for enzyme substrate reaction. (7)
  
3.
  - (a) Derive the performance equations (for constant density system) for an ideal plug flow reactor and discuss the design procedure. (7)
  - (b) A zero order homogeneous gas reaction  $A \rightarrow R$  proceeds in constant volume batch reactor, 20% inerts, and the pressure rises from 1 to 1.3 atm in 2 minutes. If the same reaction takes place in a constant pressure batch reactor, what is the fractional volume change in 4 minutes, if feed is at 3 atm and consists of 40% inerts. (7)
  
4. A series reaction,  $A \rightarrow R \rightarrow S$ , with  $k_1$  and  $k_2$  as rate constant for the first and second steps respectively with  $C_{R0} = C_{S0} = 0$  is to be conducted in plug flow reactor. Both steps are of first order. Obtain an expression for optimum space time corresponding to maximum concentration of  $R$ . also find  $C_{Rmax}$  if  $k_1 = k_2$ . (14)
  
5.
  - (a) discuss the integral and differential methods of analyzing kinetic data with their limitations. (7)
  - (b) a homogeneous liquid phase second order reaction  $A \rightarrow R$  takes place with 50% conversion in a CSTR, if this CSTR is replaced by another CSTR having volume 2 times more than that of earlier one. How much enhancement in conversion will be possible? (7)
  
6. (a) A is decomposed according to the following scheme:  
$$A \rightarrow R, r_R = 1; A \rightarrow S, r_S = 2C_A; A \rightarrow T, r_T = C_A^2$$

If  $C_{A0}$  is 4, find the maximum expected  $C_S$  for isothermal operation in (i) plug flow reactor  
(ii) mixed flow reactor. (14)

7. (a) A first order reaction is to be treated in series of mixed flow reactors. Show that the total volume of the mixed flow reactors is minimum, when the reactors are in equal in size. (7)
- (b) a liquid reactent stream (1 mol/lit) passes through two mixed flow reactors in series. The concentration of A in the exit of the first reactor is 0.5 mol/lit. find the concentration in the exit stream of the second reactor . the reaction is second order with respect to A and  $\frac{V_2}{V_1} = 2$ . (7)
8. (a) explain the recycle reactor and the governing equations. (7)
- (b) at present conversion is  $\frac{2}{3}$  for our elementary second order liquid reaction.  $2A \rightarrow 2R$ , when operating in an isothermal plug flow reactor with a recycle ratio of unity, what will be the conversion if the recycle stream is shut off? (7)

**CHE-3.2.3**  
**III/IV B.Tech Degree Examination &**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**Second Semester**  
**Model paper**  
**Process Instrumentation**  
*(effective from the admitted batch 2015-2016)*

Time: 3 hours.

Max. Marks: 70

Answer the following questions

Question No. 1 is compulsory and Answer any 4 from the remaining

1. Explain the Following Briefly (7x2=14)
  - a. Lambert's law.
  - b. Self -heating Error in RTD'S.
  - c. Radiation Receiving Elements.
  - d. Level measurement by weighing.
  - e. Wet bulb depression.
  - f. Dip Effect in mercury Thermometer
  - g. D'Arsonval Meter Movement
2.
  - a) Explain the construction and working of a Pressure Spring Thermometer with a neat diagram.(7)
  - b) What are the sources of static errors in a pressure spring thermometer and how would you minimize them. (7)
3.
  - a) What are Industrial Thermocouple? Name few of them?(4)
  - b) Describe the construction and working of an Industrial millivoltmeter and Discuss the sources of static errors and how would you minimize them. (10)
4.
  - a) Discuss Static and dynamic characteristics of an Instrument.(6)
  - b) Describe dynamic response of 1<sup>st</sup> order type instruments with suitable equations (8)
5.
  - a) Write about construction of RTD Bulb.(5)
  - b) Explain in detail the Double Slide wire method for measurement of temperature with a neat Circuit diagram. (9)
6.
  - a) What is a Spectrometer? Explain the construction and working of a UV absorption spectrometer.(8)
  - b) In pirani vacuum gauge, the calibration depends on the kind of gas measured. On what physical effect is this based? Explain. (6)
7. What is a pyrometer? Explain the principle and working of optical pyrometer with the help of neat diagrams. Discuss the factors influencing the use of optical pyrometer. (14)
8.
  - a) Discuss any one of the hydrostatic pressure method for measuring level in an open vessel. (7)
  - b) Describe the measurement of density or specific gravity by Weight method.(7)

**CHE-3.2.4**  
**III/IV B.Tech Degree Examination &**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**Second Semester**  
**Model paper**  
**Chemical Engineering Mathematics**  
*(effective from the admitted batch 2015-2016)*

Time: 3 hours.

Max. Marks: 70

**Answer FIVE questions.**  
**Question No.1 is compulsory**  
**Answer any FOUR questions from the rest.**  
**All questions carry equal marks.**

1. Write briefly about the following:  $7 \times 2 = 14$ 
  - a) The law of conservation of mass and energy.
  - b) Define the order and degree of a differential equation
  - c) Distinguish between ordinary differential equation and partial differential equation.
  - d) Derive the relation between operator E and  $\Delta$
  - e) Briefly explain the properties of the difference operator  $\Delta$ .
  - f) Explain the propagation through addition.
  - g) Explain the Lagrange's interpolation formula.
2. A tank contains  $100 \text{ m}^3$  of fresh water,  $2 \text{ m}^3$  of brine having a concentration of  $1 \text{ kg/ m}^3$  of salt, is run into the tank per minute and the mixture kept uniform by mixing, runs out at the rate of  $1 \text{ m}^3 / \text{min.}$ . What will be the exit brine concentration when the tank contains  $150 \text{ m}^3$  of brine?
3. Derive an expression for temperature profile in radial direction when the heat transfer through a cylindrical conductor.
4. A tabular chemical reactor of length L and  $1.0 \text{ m}^2$  in cross section is employed to carry out a first order chemical reaction in which a material A. is converted to a product B. the chemical reaction can be represented.



And the specific reaction rate constant is  $k \text{ h}^{-1}$ . If the feed rate is  $u \text{ m}^3/\text{h}$ , the feed concentration of A is  $C_0$  and the diffusivity of length long the reactor. It may be assumed that there is no volume change during the reaction, and that steady state conditions are established.

5. Heat is supplied at a fixed  $Q \text{ Btu / h.ft}^2$  to one face of a large rectangular slab of density  $\rho \text{ lb/ft}^3$ , specific heat  $C_P \text{ Btu /lb } ^\circ\text{F}$ , and conductivity  $K \text{ Btu /h. ft } ^\circ\text{F}$ , find the variation of surface temperature with time during the early stages after exposure.

6. Solve the following difference equations:

$$(a) Y_{n+4} - 9Y_{n+3} + 30Y_{n+2} - 44Y_{n+1} + 24Y_n = 4^n a$$

$$(b) Y_{n+2} + 2AY_{n+1} + BY_n = 0 \text{ given that } Y_0 = 0, Y_1 = 3, Y_2 = 6, Y_3 = 36$$

7. A benzene-toluene feed containing 60 mole percent of benzene is fed continuously to a distillation column. If there are 9 plates between the reboiler and the feed plate, and top product contains 98 mole percent benzene whilst the liquid leaving the base of the column contains 2 mole per cent benzene, estimate the overall plate efficiency of the column. The feed enters the column at its boiling point and the relative volatility of benzene to toluene can be considered to be constant at 2.3. The reflux ratio is 3.0.

8. Use the method of average to find the best curve of the type:

$$Y = A \sin(X + B)$$

Which fits the following values. A and B are constants.

X	0°	30°	60°	90°	120°	150°
Y	0.944	1.242	1.208	0.850	0.264	-0.392

**CHE-3.2.5**  
**Model Question Paper**  
**III/IV B.TECH I SEM (Chemical & Bio-Technology)&**  
**III/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**PROCESS DYNAMICS AND CONTROL**

Time: 3 hours

Max. Marks: 70

Question no.1 is Compulsory,  
Answer Four questions from remaining questions

1.Explain the following

- (i) Process control
- (ii) Servo system
- (iii) Negative feedback
- (iv) Regulatory system
- (v) Corner frequency
- (vi) Rate control
- (v) Transportation Lag

[14]

2.(a) Derive the transfer function for mercury thermometer with Step input.

(b) What is a distributed parameter system Explain [9+5]

3.(a) What is an interacting system.

(b) Considering a two-tank interacting liquid system ,develop an expression for the transfer function. Also obtain an expression for a unit step response of such a system [5+9]

4.(a) Derive the transfer functions for P,P-D,P-I,P-I-D controllers.

(b) Show typical feedback control system and explain the different components involved [7+7]

5.(a) Discuss the Bode stability criteria

(b) Sketch the Root locus for the following equation

$$G = \frac{K}{(S+4)(S+2)(S+3)}$$

On your sketch you should locate quantitatively all poles, zeroes and asymptotes [6+8]

6. (a) Explain the Cascade controller

(b) Explain the F-F controller [7+7]

7.(a) Describe completely the Internal model control structure

(b) Design an IMC controller for the process which is first order

$$G_m = \frac{K}{(\tau S + 1)} \quad [7+7]$$

8. (a) Explain the Cascade controller

(b) Write notes on Control valve characteristics [7+7]

CHE-3.2.6 A

**Model question Paper**  
**3/4 B.Tech Degree Examination &**  
**3/6 B.Tech+M.Tech(Double degree course)**  
**Second Semester**  
**Chemical Engineering**  
**Elective II- Computer Applications in Chemical Engineering**  
**(Effective from the admitted batch of 2015-16)**

Time : 3hrs

Max. Marks: 70

Answer question no. 1 and any other FOUR questions  
All questions carry equal marks

1. Answer the following in brief 7×2=14
- (a) Bisection method
  - (b) Ordinary differential equation
  - (c) Gauss elimination method
  - (d) Curve fitting
  - (e) Lagrange's interpolation
  - (f) Numerical differentiation
  - (g) Simpson's rule
2. Find the root of the equation  $x^2 - 25 = 0$  numerically by regula Falsi method
3. Solve the equation  $\frac{1}{\sqrt{f}} = 2 \log_{10}(NRe\sqrt{f}) - 0.8$  by Newton Rapson method, assume  $NRe=10^4$ .
4. The waste acid from a nitrating process contains 23% HNO<sub>3</sub>, 57% H<sub>2</sub>SO<sub>4</sub> and 20% H<sub>2</sub>O by weight. This acid is to be concentrated to contain 27% HNO<sub>3</sub> and 60% H<sub>2</sub>SO<sub>4</sub> by the addition of concentrated H<sub>2</sub>SO<sub>4</sub> containing 93% acid and concentrated HNO<sub>3</sub> containing 90% HNO<sub>3</sub>. Calculate the weights of the waste and concentrated acids that must be combined to obtain 1000Kg of desired mixture by Gauss elimination method.
5. The following heat transfer data is expected to follow the functional form  $Nu = aRe^b$ , where Nu is Nusselt number and Re is Reynolds number. Obtain the best values for the constants a and b by the method of least squares

Re	12	20	30	40	100	300	400	1000	3000
Nu	2	2.5	3	3.3	5.3	10	11	17	30

6. The design of a fixed bed catalytic reactor requires the use of the following equations  $\frac{W}{F_{A0}} = \int_0^x \frac{dx_A}{-r_A}$ , where  $-r_A = \frac{3.38 \times 10^{-3}(1-x)(2-x)}{(3.02+0.5x)} \frac{\text{gmol} \text{ A}}{\text{Kcal.min}}$ . Where W is the weight of the catalyst and x is the fractional conversion,  $F_{A0}$  is molar rate of A to the reactor=11.2 g mol/min. Calculate the weight of the catalyst necessary to obtain conversion of 0.1, using Trapezoidal rule and Simpson's 1/3 rule.
7. Solve the equation  $10 \frac{dy}{dx} = x^2 + y^2$ ,  $y(0)=1$ , by using Runge Kutta method for the interval  $0 \leq x \leq 0.4$  with  $h=0.1$ .
8. The temperature gradient in the furnace wall heated from one side at a particular instant of time is given by the following equation  $\frac{dT}{dx} = -40x^3 + 72x^2 + 24x - 70$ , where x is in meters. Solve the above equation by Euler method to calculate temperature profile (T as a function of x) for the range of  $0 \leq x \leq 0.5$  in steps of 0.05 meters, given that  $T=1000$  at  $x=0$ .

**CHE-3.2.6 B**  
**Model Question paper**  
**<sup>3</sup>/<sub>4</sub> B.TECH DEGREE EXAMINATION &**  
**<sup>3</sup>/<sub>6</sub> B.Tech+M.Tech (Double degree course)**  
**Chemical Engineering**  
**Second Semester**  
**Elective-II: PETROLEUM REFINERY ENGINEERING-I**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 Hrs

Max marks: 70

*Question No.1 is compulsory.*  
*Answer any FOUR questions from the remaining.*  
*All questions carry equal marks.*

1. Answer the following:
  - a) Diesel Index
  - b) Smoke point
  - c) Fire point
  - d) API gravity
  - e) Viscosity Index
  - f) Octane number
  - g) Penetration Index
2. Write about Indian petroleum industry and world crude oil reserves.
3. Explain briefly about the composition and general properties of crude oil.
4. Explain the production of LPG with neat flow diagram.
  - Absorption technique
  - Natural gas liquefaction
5. Why aromatics are removed from kerosene. Explain the extraction of aromatics by liquid sulfur dioxide with neat flow diagram.
6. Explain the thermal and catalytic cracking mechanism. Explain the fluid catalytic cracking with neat flow diagram.
7. Explain the alkylation process. Explain the cascade sulfuric acid process with neat flow diagram.
8. Explain the chemical structure of Asphalt. Explain Air blown asphalt of bitumen with neat flow diagram.



**CHE-3.2.6 C**  
**Model Question paper**  
**<sup>3</sup>/<sub>4</sub> B.TECH DEGREE EXAMINATION &**  
**<sup>3</sup>/<sub>6</sub> B.Tech+M.Tech (Double degree course)**  
**Chemical Engineering**  
**Second Semester**  
**Elective-II: WHITEWARE AND HEAVY CLAYWARE**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 Hrs

Max marks: 70

*Question No.1 is compulsory.*  
*Answer any FOUR questions from the remaining.*  
*All questions carry equal marks.*

1. Answer the following in brief. (7x2=14)
  - (a) High alumina bodies
  - (b) MOR
  - (c) Permeability
  - (d) Chipping resistance
  - (e) Porcelain
  - (f) Alkali resistance
  - (g) Vitrification
  
2. Explain the body formulation and properties of (14)
  - (a) Table ware
  - (b) Earthen ware
  - (c) Sanitary ware
  - (d) Stone ware
  
3. Explain the body composition, manufacturing and properties of white wares at (14)
  - (a) Home
  - (b) Industry
  
4. Give the classification, manufacturing of various construction of ceramic materials? (14)
  
5. (a) Explain the various factors affecting porosity in fine ceramics. (14)  
(b) Explain characterization of fine ceramics.
  
6. Discuss various inspection methods used in manufacturing of heavy clay ware. (14)
  
7. Explain the body composition, manufacturing and properties of white ware used in electrical appliances? (14)
  
8. Explain the following (14)
  - (a) Thermal shock resistance
  - (b) Role of water
  - (c) Drying of Green body
  - (d) Lubricant functions.

**CHE-4.1.1**  
**Model question Paper**  
**4/4 B.Tech Degree Examination &**  
**4/6 B.Tech+M.Tech(Double degree course)**  
**First Semester**  
**Chemical Engineering**  
**Transport Phenomena**  
**(Effective from the admitted batch of 2015-16)**

Time : 3hrs

Max. Marks: 70

Answer question no. 1 and any other FOUR questions selecting at least ONE question from each section.

All questions carry equal marks

The Tables of equations of change are to be provided.

1. Write short notes on the following 7×2=14
- (a) Time independent fluids
  - (b) Time smoothed velocity
  - (c) Thermal penetration thickness
  - (d) Effect of temperature and pressure on viscosity of gases
  - (e) Mass average velocity
  - (f) Lorenz number
  - (g) Mass transfer coefficient

Part A

2. A fluid is flowing through a long horizontal cylindrical duct of radius R under a pressure difference. The cylinder is also in motion with a constant velocity 'V' in the direction of fluid flow. Obtain expression for momentum distribution and velocity profile. Sketch the profiles 14
3. Determine  $v_{\theta}(r)$  between two coaxial cylinders of radius R and kR rotating at angular velocities  $\omega_0$  and  $\omega_i$  respectively. 14
4. (a) The following expression for drag force on flat plate of width W and length L, wetted on both sides  $F_k = 1.328\sqrt{\rho\mu LW^2v_{\infty}^3}$ . Define friction factor and Re number and obtain expression for f vs Re 7
- (b) What pressure drop is required in order to pump water at 25°C through a pipe 25cm in diameter and length 1234m at a rate of 1.97 m<sup>3</sup>/s. The pipe is horizontal and contains four standard radius 90° elbows and two 45° elbows. (A standard 90° elbow is roughly equal to the resistance offered by the pipe of 32 diameters and 45° elbow, 15 diameters) 7

Part B

5. A Newtonian fluid with density  $\rho$  and viscosity  $\mu$  is placed between two flat parallel vertical parallel walls at a distance 2b apart. There is no through flow of air. The wall at  $y=-b$  is maintained at a temperature  $T_2$  and the wall at  $y=+b$  is maintained at a temperature  $T_1$  and  $T_2>T_1$ . Using shell balance approach, arrive at the steady state temperature and velocity distribution relation for the free convection flow system as a result of existing temperature gradient. 14
6. An oil at 35°C flowing through a 2 cm ID copper tube of 3m length at a rate of 50 kg/min. The inside surface of the tube is maintained at 1000°C. Assuming fully developed flow calculate the exit temperature of the oil.  
 $\rho=0.9$  g/cc  $\mu=5$  cp,  $K=0.12$  Kcal/hrm<sup>0</sup>C,  $c_p=0.56$  Kcal/kg<sup>0</sup>C 14

Part C

7. Helium is separated from natural gas by passing through a pyrex tube. Obtain an expression for the rate at which Helium will leak through the tube in terms of diffusivity of Helium through pyrex, interfacial concentration of Helium and the dimensions of the tube. 14
8. An open tank 5m in diameter contains  $C_6H_6$  at  $25^{\circ}C$  and is exposed to atmosphere i.e. the liquid is covered with a stagnant film of 4m thick. The concentration of B on the film is negligible. The vapor pressure of  $C_6H_6$  at  $25^{\circ}C$  is 100mmHg. Determine amount of  $C_6H_6$  evaporated from the tank per day.  $D_{AB}$  of  $C_6H_6$  is  $0.074 \text{ cm}^2/\text{s}$ . 14

**CHE-4.1.2**  
**Model question paper**  
**4/4 B.Tech. DEGREE EXAMINATION &**  
**4/6 B.Tech+M.Tech(Double degree course)**  
**CHEMICAL ENGINEERING**  
**FIRST SEMESTER**  
**INDUSTRIAL MANAGEMENT**  
**(Effective from the admitted batch of 20015-16)**

Time: 3 Hours

Max Marks: 70

Answer question No.1 compulsorily and  
any FOUR from the remaining.  
*All questions carry equal marks.*

1. Explain the following briefly: (7x2)
  - (a) Skills of a manager
  - (b) Levels of management
  - (c) Organization
  - (d) Sole proprietor
  - (e) Plant location
  - (f) Work study
  - (g) Manpower planning
2. Define Management. What are the functions of management? (14)
3. Explain the principles of management as outlined by Henry Fayol. (14)
4. Illustrate the different types of Organization structures with their merits and demerits. (14)
5. What is a Joint stock company? What are its features, merits and demerits? (14)
6. Describe the objectives and functions of Production planning and control. (14)
7. What is Plant layout? Distinguish between Product layout and Process layout. (14)
8. Discuss the functions of Human resource manager in an industrial setting. (14)

**CHE 4.1.3.**  
**(Model Paper)**  
**4/4 B.TECH(CHEM)IIND SEMESTER &**  
**4/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Plant Equipment Design**  
**(Effective from the admitted batch of 20015-16)**

Answer to Q.No.1 is compulsory. Answer any FOUR from the remaining questions. All questions carry equal marks.

Time: 3 hours

Max. Marks: 70

- 
1. Answer briefly to the following (7x2 = 14)
- (a) UVCE
  - (b) LD<sub>50</sub>
  - (c) LMTD
  - (d) Safety indices
  - (e) Reflux ratio
  - (f) Utilities
  - (g) Scale up
2. Write about fire and explosion hazards.
3. With the help of neat sketches explain the construction and working of reciprocating pumps. Show discharge curves also.
4. Explain 'Design Project Procedure' with an example.
5. A pump draws a solution (specific gravity = 1.84) from a storage tank of large cross section through a pipe of 0.08 m id. The average fluid velocity in the suction line is 3 m/s. The pump discharges through a 0.065 m id pipe. The end of the discharge line is 35 m above the level of the solution in the feed tank. Frictional losses in the entire system are 4.7 m of the solution. What pressure must the pump develop in pascals. Assume an overall efficiency of 60%. Calculate the energy requirements in kWh.
6. A process cylindrical vessel is to be designed for the maximum operative pressure of 500 kN/m<sup>2</sup>. The vessel has a nominal diameter of 1.2 m and a tangential length of 2.4 m. The vessel is made of steel having a design stress of 118 MN/m<sup>2</sup> at working temperature. The corrosion allowance is 2 mm for the expected life span. The weld efficiency is 0.85.
- (a) What will be the standard plate thickness to fabricate this vessel?
  - (b) If a spherical vessel having the same dia and thickness is fabricated with the same steel, what maximum internal pressure the sphere will withstand?
7. A single effect evaporator operates at 13 kPa. The heating surface is 1.2 m below the liquid level. The evaporator concentrates 1.25 kg/s of 10% caustic soda to 41% using steam at 390 K. The feed temperature is 291 K and the Boiling Point elevation is 30°C. Calculate the heating surface required. Data: C<sub>p</sub> (feed) = 4 kJ/(kg.K); C<sub>p</sub> (product) = 3.76 kJ/(kg.K); C<sub>p</sub> (boiling liquid) = 1.39 kJ/(kg.K); U<sub>o</sub> = 1.25 kW/(m<sup>2</sup>.K).
8. Write short notes on: (7+7)
- (a) Mechanical features of reactor design
  - (b) Selection of materials

**CHE-4.1.4**  
**IV/IV B.Tech Degree Examination &**  
**4/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Second Semester**  
**Chemical Engineering**  
**Process Engineering Economics**  
**Model Paper**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 hours

Max Marks: 70

Answer Question no.ONE & any other FOUR questions

All questions carry equal marks

1. Write briefly on the following (7X2 =14)
  - a) Economic study
  - b) Interest
  - c) Types of depreciation
  - d) General expenses
  - e) Replacement
  - f) Break even point
  - g) Fixed capital investment
  
2. A machine costing Rs.30,000 with a life of 5 years and having no salvage value requires Rs.2000 a year for maintenance and operation. Money is worth 10 %.
  - a. What is the present worth of the service rendered by this machine?
  - b. What is the future worth of 5 years service rendered by the machine?
  - c. What will be the capitalized cost of this service? (5+5+4)
  
3. What is the difference in rupees after 10 years for a Rs.1,00,000 investment at the present time if interest is 10% when
  - a) The interest payments are annual
  - b) The interest payments are quarterly
  - c) The interest payments are continuous (4+5+5)
  
4.
  - a) Explain briefly about service life, salvage value, Scrap value and book value.
  - b) Explain in detail any two methods of depreciation.
  - c) A company installed a reactor for Rs.2,00,000 which is expected to be used for 10 years and the salvage value of it is Rs.10,000. What is the book value of the reactor at end of 7<sup>th</sup> year using at least three methods of depreciation if the money is 10% worth? (4+4+6)
  
5.
  - a) What is a Break even chart? Explain in detail.
  - b) The annual fixed costs for a plant are Rs.2,00,000 and variable costs are Rs.2,80,000 at 70 per cent capacity with net sales of Rs.5,60,000. What is the break-even point in units of production if the selling price per unit is Rs.80? (7+7)
  
6.
  - a) Discuss in detail about cash flow in industrial operations
  - b) Explain the estimation of total product cost.
  
7. What is economic balance? Explain in detail the economic balance of fluid flow and cyclic operations.
  
8. Write notes on the following
  - a) Balance sheet and income statement
  - b) Economic production charts
  - c) Cost indices

**CHEM-4.1.5**  
**IV/IV B.Tech. Degree Examination &**  
**IV/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**CHEMICAL REACTION ENGINEERING – II**  
**MODEL QUESTION PAPER**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 hours

Max. Marks: 70

Answer question No. 1 and any FOUR questions.

All questions carry equal marks.

- 1) Write very briefly about the following: [7x2 =14]
- a) Vant Hoff's relation
  - b) Characteristics of the RTD
  - c) Thiele modulus
  - d) Dispersion number and its significance
  - e) Optimum temperature progression
  - f) Chemisorption
  - g) Catalyst poisons
- 2) a) Discuss the Non ideal flow pattern exists in different process equipment with their diagrams. (7)
- b) Outline a method for estimating residence time distribution in such reactors. (7)
- 3) Fit the Tanks in series model to the following data obtained from a pulse input experiment. Calculate the conversion. Take the rate expression as  $-r_A = 0.05 C_A$ , mol/lit min
- |               |   |     |     |     |     |      |       |       |      |
|---------------|---|-----|-----|-----|-----|------|-------|-------|------|
| Time (min)    | : | 0-2 | 2-4 | 4-6 | 6-8 | 8-10 | 10-12 | 12-14 |      |
| Tracer        |   |     |     |     |     |      |       |       |      |
| Concentration | : | 0   | 2   | 10  | 8   | 4    | 2     | 0     | (14) |
- 4) a) Differentiate between physical adsorption and chemical adsorption (7)
- b) Write a note on pore volume distribution of catalyst and explain the methods to find pore volume and solid density. (7)
- 5) Develop the expression for concentration profile and effectiveness factor for first order reaction in a cylindrical pore of a catalyst. (14)
- 6) For the reaction  $A + B \rightleftharpoons R + S$  taking place on a solid catalyst, develop an expression for the rate of reaction of the catalyst if surface reaction is controlling the overall reaction.
- 7) Obtain a relation between time, radius and conversion when diffusion through gas film and chemical reaction control the reaction in a Shrinking-Core model for spherical particles of unchanging size. (14)
- 8) Calculate the time needed to burn to completion particles of graphite ( $R_0 = 5$  mm,  $\rho_B = 2.2$  gm/cm<sup>3</sup>,  $k'' = 20$  cm/sec) in an 8% oxygen stream. For the high gas velocity used assume that film diffusion does not offer any resistance to transfer and reaction. Reaction temperature is 900°C.  $A(g) + bB(s) \rightarrow R(s)$ ,  $t = R_0 \rho_B / b k'' C_{Ag}$  (14)

**CHEM-4.1.6 A**  
**4/4 B.TECH DEGREE EXAMINATION &**  
**4/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Chemical Engineering**  
**First Semester**  
**Elective-III-COMPUTER AIDED DESIGN**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 Hrs

Max marks: 70

*Question No.1 is compulsory.*  
*Answer any FOUR questions from the remaining.*  
*All questions carry equal marks.*

1. Write in brief on the following: (7x2)
  - a) Non Newtonian fluids
  - b) Simulation
  - c) Evaporators
  - d) Tube pitch
  - e) Liquid liquid extraction
  - f) Extent of reaction
  - g) Antonie equation
2. Explain the simulation process using flow sheet approach.
3. Write the stepwise procedure for the sizing of pipes for Newtonian fluid flow.
4. Write the stepwise procedure for the rating calculation of a shell and tube heat exchanger, without phase change.
5. Write stepwise procedure for the rating calculations of a triple effect evaporator.
6. Give the detailed procedure for the design of a binary distillation column using McCabe-Thiele method.
7. Write stepwise procedure for Flash calculations.
8. Write stepwise procedure for the design of a CSTR for a first order chemical reaction.



**CHE-4.1.6 B**  
**IV/IV B.Tech. DEGREE EXAMINATION &**  
**IV/VI B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**CHEMICAL ENGINEERING**  
**FIRST SEMESTER**  
**Elective- III : INDUSTRIAL POLLUTION AND CONTROL ENGINEERING**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 Hours

Max.Marks: 70

Answer question No.1 and any other Four questions

All questions carry equal marks

1. Write briefly on: (7x2 = 14)
  - a) Occupational health hazard
  - b) Adiabatic Lapse Rate (ALR)
  - c) B.O.D
  - d) Ultra filtration
  - e) Safety effectiveness
  - f) Toxicity
  - g) Cyclone separators
2. a) Describe the method of estimating stack height of chimneys. (10)  
b) What are the discharge standards of vent gas for chimneys? (4)
3. a) Explain oxygen sag curve along with a neat diagram. (7)  
b) What are the discharge standards of waste waters into river? Describe a typical effluent treatment plant. (7)
4. a) Describe various methods to remove sulphur dioxide from vent gas. (7)  
b) What are fugitive emissions? Explain the method of controlling them. (7)
5. a) Describe activated sludge process with a neat sketch. (10)  
b) Explain function of aerated lagoons. (4)
6. a) Explain hoe tertiary treatment of effluents will be useful in achieving zero discharge. (7)  
b) Describe reverse osmosis process with a neat diagram. (7)
7. Describe solid waste management and recovery of valuable products from solid wastes. (14)
8. a) Describe various types of personnel protective equipment and explain their application. (10)  
b) Explain various respiratory hazards. (4)

**CHE-4.1.6 C**  
**Model Question Paper**  
**4/4 B.Tech FIRST SEM (Chemical Engineering) &**  
**4/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**Process Optimization**  
**(Effective from the admitted batch of 2015-16)**

Time: 3 hours

Max. Marks: 70

Question no.1 is Compulsory,  
 Answer Four questions from remaining questions

1. Explain the following

- a) Optimization
- b) Concave Function
- c) Scanning and Bracketing
- d) Penalty function
- e) Global Optimization
- f) Hessian Matrix
- g) Lagrange Multiplier

(14)

2. Suppose you are a chemical distributor who wishes to optimize the inventory of a specialty chemical. You expect to sell 'Q' barrels of this chemical over a given year at a fixed price with demand spread evenly over the year. If Q=1,00,000 barrels per year, you must decide on a production schedule. Unsold production is kept as inventory..(14)

3. Consider the following objective function  $f=x_1^2+2x_1+3x_2^2+6x_2+4$ . List stationary points and their classification: maximum, minimum and saddle point

4. a) Describe Golden Section method completely

b) Minimize the function  $f(x)=x-x^2$ , Starting with  $x_0=0.3, \Delta = 0.1$  by Golden Section method (6+8)

5. a) Explain modified Marquardt method of multivariable search.

b) You are to minimize  $f(x) = 2x_1^2 - 4x_1x_2 + x_2^2$  and approximate  $H(x)$  that is positive definite by Marquardt's method. (6+8)

6. Minimize  $f(x) = 8.1 x_1 + 10.8 x_2$

Subject to  $0.80 x_1 + 0.44x_2 \leq 24000$

$0.05 x_1 + 0.10x_2 \leq 2000$

$0.10 x_1 + 0.36x_2 \leq 6000$

by linear programming method.

(14)

7. Test the following function for necessary and sufficient conditions

Minimize  $f(x) = (x_1-1)^2 + x_2^2$

Subject to  $g_1(x) = -x_1 + (x_2^2/4) \geq 0$  or

$g_2(x) = -x_1 + x_2^2 \geq 0$

(14)

8. Minimize  $f(x) = 2x_1^2 - 2x_1x_2 + 2x_2^2 - 6x_1 + 6$

Subject to  $h(x) = x_1 + x_2 - 2 = 0$

by augmented Lagrange multiplier method

(14)

**CHE-4.1.6 D**  
**MODEL QUESTION PAPER**  
**4/4 B.TECH (CHEMICAL) FIRST SEMESTER &**  
**4/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**SUB: ELECTIVE – III: FUELS, REFRACTORIES AND FURNACES.**  
**(Effective from the admitted batch of 2015-16)**

Time:3 hrs

Marks:70

Answer Question no.1 and any four from the remaining Questions.  
All questions carry equal marks.

1. State the following
  - (a) Nuclear Fuel
  - (b) Biomass
  - (c) Water gas
  - (d) Blast Furnace Gas
  - (e) RUL
  - (f) Spalling resistance
  - (g) combustion
  
- 2.(a) Define furnace. Discuss various possible reasons of heat losses in furnaces and suggest method to minimize heat loss  
(b) Define refractory and classify it. Give two examples of each. Give the advantages of monolithic refractories.
  
- 3.(a) Explain the construction and working of arc furnace. Enlist the advantages of direct arc furnaces.  
(b) Describe the construction and working of cupola furnace. Give advantage of its applications.
  
4. What is Thermocouple? Explain the method used for thermocouple construction and calibration. Discuss about thermoelectric inversion.
  
- 5.(a) Write the composition and application of producer gas. Discuss the manufacturing process of it.  
(b) Explain the proximate analysis method for a given coal sample
  
- 6.(a) Explain the working principle of muffle furnace with figure  
(b) What are the general requirements of a refractory material?
  
- 7.(a) Explain the raw materials used, manufacturing method and properties of fire clay.  
(b) Explain the raw materials used, manufacturing method and properties of dolomite refractory.
  
- 8.(a) Define carbonization and differentiate between Low Temperature carbonization (LTC) and High Temperature carbonization (HTC)  
(b) Define Stefan-Boltzmann's Law  
(c) Draw flow sheet for wet or dry process of Magnesium bricks manufacture.

**CHE-4.1.6 E**  
**MODEL QUESTION PAPER**  
**4/4 B.TECH (CHEMICAL) FIRST SEMESTER &**  
**4/6 B.TECH+M.TECH(DOUBLE DEGREE COURSE)**  
**SUB: ELECTIVE – III: RESERVOIR ENGINEERING.**  
**(Effective from the admitted batch of 2015-16)**

Time:3 hrs

Marks:70

Answer Question no.1 and any four from the remaining Questions.

All questions carry equal marks.

- 1.(a).Define Permeability and Fluid saturation.
  - (b).What is Klinkenberg's effect?
  - (c).Briefly discuss about Volatile oil reservoirs.
  - (d).What are the characteristics of Depletion drive reservoirs?
  - (e). What are the characteristics of gravity drainage reservoir?
  - (f). What are the various pressure maintenance operations?
  - (g) . Briefly discuss about well arrangements in Oil reservoirs.
- 2.Derive the general Material balance equation for an Oil reservoir.
- 3.Write the step by step procedure for performing reservoir study of a Depletion drive reservoir.
- 4.What are the various Oil reservoirs and discuss about them.
5. Derive the material balance equation for gas injection pressure maintenance operation.
6. Write about the stiles method of water flood prediction.
7. Derive the unsteady state equation for predicting the reservoir performance of a Water drive reservoir.
8. Write a detailed note on Combination drive reservoirs and bring out the salient features of it.