M 26786

Reg. No. : .....

Name : .....

I and II Semester B.Tech. Degree (Reg./Supple./Imp. Including Part time) Examination, April 2015
(2006 and Earlier Admn.)
(Common to all Branches)
EN2K/PTEN2K 101 : ENGINEERING MATHEMATICS – I

Time : 3 Hours Max. Marks : 100

1. a) Evaluate $\lim_{x \to 0}\left(\frac{1}{x}\right)^{\tan x}$.

   b) If $u = \frac{xy}{z}$, $v = \frac{yz}{x}$, $w = \frac{zx}{y}$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.

   c) Test the convergence or divergence of the series $1+\frac{2^2}{2!}+\frac{3^2}{3!}+\frac{4^2}{4!}+\cdots$.

   d) Expand tan x using Maclaurin's expansion upto the term containing x^5.

   e) Find the rank of the following matrix by reducing it to the normal form

$$\begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}.$$

   f) Find the eigen values of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

   g) Obtain the Fourier series representation of $f(x) = 1 - x^2$ in $-1 < x < 1$.

   h) Obtain the half range cosine series of $f(x) = x$ in $0 < x < 2$. **(8×5=40)**

P.T.O.

2. a) i) Find the radius of curvature for the curve $x^3 + y^3 = 3axy$ at the point $\left(3a/2, 3a/2\right)$. 8

ii) State and prove Euler's theorem for a homogeneous function u(x, y) of degree n. 7

OR

b) i) Find the extreme values of $f(x, y) = xy\,(a - x - y)$, $a > 0$. 10

ii) Prove that the radius of curvature of a circle is a constant. 5

3. a) i) Test the convergence of the series

$$1+\frac{2}{5}x+\frac{6}{9}x^2+\frac{14}{17}x^3+\ldots+\frac{2^{n+1}-2}{2^{n+1}+1}x^n+\ldots$$ 7

ii) Obtain the Maclaurin's expansion of $e^{x \cos x}$ upto the terrn containing x^4. 8

OR

b) i) If $y = \log\left(x+\sqrt{1+x^2}\right)$ prove that $(1 + x^2)\, y_{n+2} + (2n + 1)\, xy_{n+1} + n^2 y_n = 0$. 7

ii) Test for convergence, the series $\frac{1}{1.3.5}+\frac{2}{3.5.7}+\frac{3}{5.7.9}+\ldots$ 8

4. a) i) Test for consistency and solve by Gauss elimination method $2x_1 + x_2 + 4x_3 = 12$; $4x_1 + 11x_2 - x_3 = 33$; $8x_1 - 3x_2 + 2x_3 = 20$.

ii) State and prove Cayley-Hamilton theorem.

OR

b) i) Show that any square matrix A can be written as the sum of a Hermitian and 'Skew-Hermitian matrices. 5

ii) Determine the nature, index and signature of the quadratic form

$2x_1^2 + 2x_2^2 + 3x_3^2 + 2x_1 x_2 - 4x_1 x_3 - 4x_2 x_3$ 10

5. a) i) Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $(0, 2\pi)$. Deduce that

$$\pi/4 = 1 - 1/3 + 1/5 - 1/7 + \ldots.$$ **8**

ii) Obtain the Fourier cosine series for $f(x) = 1 - x/L$ in $0 < x < L$. **7**

OR

b) i) The following table gives the variations of a periodic current A over a period T.

t(sec)	0	T/6	T/3	T/2	2T/3	5T/6	T
A (amp)	1.98	1.30	1.05	1.30	– 0.88	– 0.25	1.98

10

Show that there is a constant part of 0.75 amp. in the current A and obtain the arnplitude of the first harmonic.

ii) Obtain Fourier sine series for **5**

$f(x) = kx$, $0 \le x < l/2$

$= k(l - x)$, $l/2 < x \le l$.

M 26787

Reg. No. : .....

Name : .....

I and II Semester B.Tech. Degree (Reg./Sup./Imp.-Including Part Time) Examination, April 2015

(2006 and Earlier Admn.)

EN2K/PTEN2K 102 : ENGINEERING MATHEMATICS – II

(Common to All Branches)

Time : 3 Hours Max. Weightage : 100

1. a) Solve $(xy + x)dx + (x^2y^2 + x^2 + y^2 + 1)dy = 0$.

   b) Find the orthogonal trajectory of the family $r^n \cos n\theta = a^n$.

   c) Find the L.T. of $t\cos^3 t$.

   d) Find the inverse L.T. of $\frac{2s-3}{s^2+4s+13}$.

   e) If $\vec{F} = \nabla(xy^3z^2)$ find div$\vec{F}$ and curl $\vec{F}$ at the point (1, –1, 1).

   f) If $\vec{F}_1$ and $\vec{F}_2$ are irrotational, prove that $\vec{F}_1 \times \vec{F}_2$ is solenoidal.

   g) Using Green's theorem evaluate $\int_C (y - \sin x)\,dx + \cos x\,dy$.

   where C is the triangle in the xy – plane formed by the lines $y = 0$, $x = \pi/2$ and $y = 2x/\pi$.

   h) Using the divergence theorem, evaluate $\int_S \vec{f}.\vec{n}\,ds$ where $\vec{f} = x^3i + y^3j + z^3k$ and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$. **(8×5=40)**

P.T.O.

2. a) Solve $(D^2 + 4)y = \tan 2x$ by the method of variation of parameters. **9**

b) Solve $y'' - 6y' + 9y = 54x + 18$. **6**

OR

c) Solve $(D^2 + 4)y = e^x \sin^2 x$. **7**

d) Solve $\frac{x^2 d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^2$. **8**

3. a) Express $\int_0^1 x^m(1-x^n)^p dx$ in terms of Beta function. Hence evaluate

$\int_0^1 x^7(1-x^4)^3 dx$. **9**

b) Using unit step function, find the Laplace transform of $f(t) = \begin{cases} \sin t, & 0 \le t < \pi \\ \sin 2t, & \pi \le t < 2\pi \\ \sin 3t, & t \ge \pi \end{cases}$ **6**

OR

c) If $L\{f(t)\} = F(s)$, then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}(F(s))$, where n = 1, 2, 3, ... **9**

d) Find the inverse transform of $\frac{5s+3}{(s-1)(s^2+2s+5)}$. **6**

4. a) Find the directional derivative of $f(x, y, z) = 4e^{2x-y+z}$ at the point (1, 1, –1) in the direction towards the point (–3, 5, 6). **6**

b) Prove that $\nabla.(\vec{A}\times\vec{B}) = \vec{B}.(\nabla\times\vec{A}) - \vec{A}.(\nabla\times\vec{B})$. **9**

OR

c) Find the constants a and b so that the surface $ax^2 - byz = (a + 2)x$ will be orthogonal to the surface $4x^2y + y^3 = 4$ at the point (1, –1, 2). **8**

d) If $\vec{A} = x^2yi - 2xzj + 2yzk$, find curl $\vec{A}$. **7**

5. a) State and prove Green's theorem. **7**

b) Using Stokes' theorem, evaluate $\int_S (\text{curl}\vec{f}).\vec{n}\, ds$ for

$\vec{f} = (y - z + 2)i + (yz + 4)j - xz\,k$ where S in the cubical surface formed by the planes $x = 0$, $y = 0$, $x = 2$, $y = 2$ and $z = 2$. **8**

OR

c) Evaluate $\int_C \vec{f}.d\vec{r}$, where C is the curve $x = 2t^2$, $y = t$, $z = t^3$ from the point (0, 0, 0) to the point (2, 1, 1). The vector $f = (2y + 3)i + xzj + (yz - x)k$. **7**

d) Using Green's theorem, evaluate $\int_C xydx + xy^2dy$, where C is the square in the xy plane with vertices (1, 0), (0, 1), (–1, 0) and (0, –1). **8**

M 26788

Reg. No. : .....

Name : .....

I and II Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, April 2015
(2006 and Earlier Admn.)
EN2K/PTEN2K 103 (A) : ENGG. PHYSICS (A)
(for CS/EE/EC/IT/AI Branches)

Time : 3 Hours Max. Marks : 100

Instructions : *Answer* ***all*** *questions.*
Assume *suitable data that are not given.*

1. a) How does the thickness of the object used in forming the airwedge influence the fringe width ? **5**
   b) Distinguish between Fresnel and Fraunhofer diffraction. **5**
   c) What are Newtonian and quantum mechanics ? **5**
   d) Explain in brief a method of detection of ultrasonics. **5**
   e) What is population inversion ? **5**
   f) What is signal distortion in optical fiber communication ? **5**
   g) Explain fermi level and fermi energy in semiconductors. **5**
   h) Explain zener breakdown in zener diode. **5**

2. a) i) With theory explain how the optical plane of a surface is tested using airwedge setup. **10**
      ii) Fringes of equal thickness are observed in a thin glass wedge of refractive index 1.52. The fringe spacing is 1 mm and λ is 5893Å. Calculate the angle of the wedge. **5**

      OR

   b) i) Explain in detail production and detection of elliptically and circularly polarised light. **10**
      ii) What are the applications of polarised light. **5**

P.T.O.

3. a) i) Discuss Electron Spin Resonance (ESR) and explain how ESR is detected by experimental method. **10**

ii) Find the energy of an electron in the 1st excited level, of a potential well of infinite height and width 1Å. Given mass of an electron 9.11×10^{-31} kg and $h = 6.63 \times 10^{-34}$ JS. **5**

OR

b) i) Derive Schrodinger's wave equation. Explain, how is it applied to study the energy state of a free particle. **10**

ii) Mention the applications of NMR. **5**

4. a) i) Describe a semiconductor laser and discuss it function and principle involved. **10**

ii) Explain in brief construction of a hologram. **5**

OR

b) i) Give general description of an optical fiber. Explain how an optical fiber function as a waveguide. **10**

ii) Discuss two basic principle involved in NMR. **5**

5. a) i) Explain in detail p type and n type semiconductors. Discuss the working of a zener diode both in forward and reverse biased conditions. **10**

ii) Explain in brief BCS theory of superconductivity. **5**

OR

b) i) What is Josephson effect. Explain the working of SQUID and mention its applications. **10**

ii) Write a brief note on photo resistor (LDR). **5**

M 26790

Reg. No. : .....

Name : .....

I and II Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, April 2015

(2006 and Earlier Admn.)

EN2K/PTEN2K 104 (A) : ENGINEERING CHEMISTRY (A)

(For CS/EE/EC/IT/AI Branches)

Time : 3 Hours Max. Marks : 100

I. a) What are the types of crystal imperfections in a solid ? 5

b) Distinguish between intrinsic and extrinsic semiconductors. 5

c) Write Faraday's laws of Electrolysis. 5

d) Write short note on concentration cells. 5

e) How does alloying affect the ratio of oxidation of a metal ? 5

f) Explain the action of driers in oil paints. 5

g) What is glass transition temperature (Tg). How is it important ? 5

h) How are lubricants classified ? 5

II. a) Explain with a neat sketch the Bragg's law of X-ray diffraction and derive the expression. 15

OR

b) Explain the following :

i) The free electron theory

ii) Super conducting materials

iii) Semi conductor Devices. 15

P.T.O.

III. a) Explain the theory of electrolytic conduction. **15**

OR

b) Explain any two types of Fuel Cells with schematic diagrams. **15**

IV. a) What is dry corrosion ? Why do metals get oxidized on exposure to air ? **15**

OR

b) What are the various ways of applying protective metallic coatings on the surface of a metal to be protected ? Discuss the applications and limitations of each method. **15**

V. a) Define the following terms with an example for each.

a) Macromolecule

b) Monomer

c) Degree of polymerization

d) Homopolymer and

e) Copolymer. **15**

OR

b) How are lubricants classified ? Explain the following.

a) Lubricant

b) Asperities

c) Tribology and

d) Coefficient of friction. **15**

M 26792

Reg. No. : .....

Name : .....

I and II Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, April 2015
(2006 and Earlier Admn.)
EN2K 105 : HUMANITIES
(Common for all Branches)

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** questions.*

I. a) Insert articles where necessary.

i) While there is life there is hope

ii) Sun rises in east

iii) Living stone was great explorer

iv) My favourite flower is rose

v) Only best quality is sold by us

b) Punctuate the following :

O Master exclaimed Ananda weeping bitterly and is all the work undone and all by my fault and folly that which is built on fraud and imposture can by no means endure returned Buddha.

c) What are the attributes of a technical report.

d) Write notes on the industrial application of "lathe".

e) "Education is the all round development of a person". Elaborate.

f) What is the importance of studying Humanities in Engineering ?

g) Write a brief note on the development of communication in India.

h) Which are the major centers of science and technology. **(8×5=40)**

II. a) Write an essay on the theme "necessity is the mother of invention".

OR

b) Write a paragraph about the evils of motion pictures among the students. **15**

P.T.O.

III. a) Explain different types of technical reports.

OR

b) Explain different styles of note making. **15**

IV. a) Elaborate on the thoughts and ideas of Pandit Jawaharlal Nehru on the Industrial development in our country.

OR

b) Explain the attributes of good communication and its importance in industry. **15**

V. a) Explain the growth of space technology in India and mention the step-by-step achievements.

OR

b) Write a note on industrial revolution in America. **15**

M 26796

Reg. No. : .....

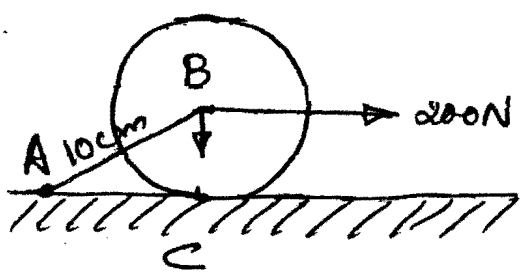
Name : .....

I and II Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, April 2015
EN 2K 107(A)/PTEN2K106(A) : ENGINEERING MECHANICS (A)
(For CE/CS/EE/EC/IT/AI Branches)
(2006 and Earlier Admn.)

Time : 3 Hours Max. Marks : 100

1. a) Explain concurrent and collinear forces with examples. 5
   b) State Varignon's theorem. 5
   c) Write the equations of equilibrium for a force system in space. 5
   d) Write short notes on direction cosines. 5
   e) Explain the types of equilibrium with examples. 5
   f) Explain parallel axis theorem. 5
   g) Define the terms angular velocity and angular acceleration. 5
   h) Define coefficient of restitution. 5

2. a) A circular roller of radius 5 cm and of weight 100 N rests on a smooth horizontal surface and is hold in position by an inclined bar AB of length 10 cm as shown in figure. A horizontal force of 200 N is acting at B. Find the tension in the bar AB and the vertical reaction at C.

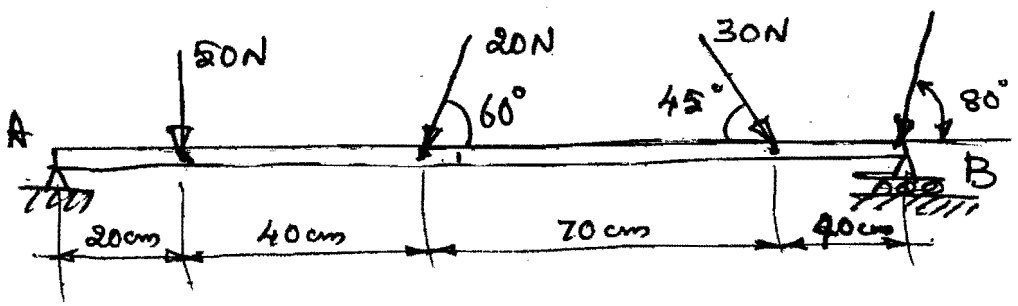


15

OR

b) A uniform ladder of length 13 m and weighing 25 N is placed against a smooth vertical wall with its lower and 5 m from the wall. The coefficient of friction between the ladder and the floor is 0.3. Show that the ladder will remain in equilibrium in this position. What is the frictional force acting on the ladder at the point of contact between the ladder and floor ? **15**

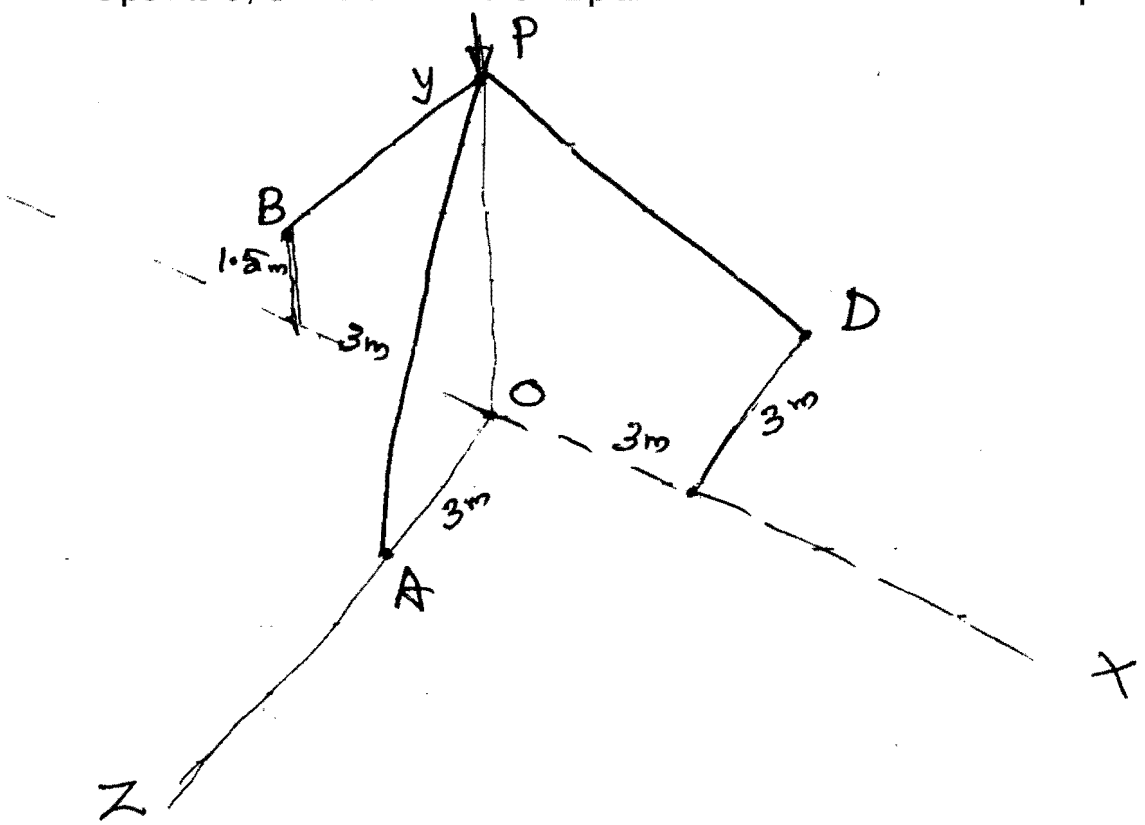
3. a)



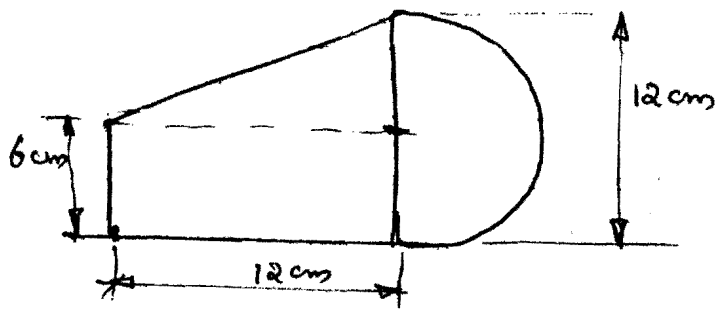
Determine the reactions at A and B. **15**

OR

b) Three bars support a vertical load of 4800 N. Find the force in each bar. The points C, O and D are in the XZ plane while B is 1.5 m above this plane. **15**

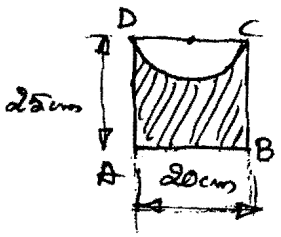


4. a) Determine the centroid of area shown in figure. **15**



OR

b) Find the moment of inertia of the area shown shaded in figure about edge AB. **15**



5. a) A body is moving with uniform acceleration and covers 15 m in fifth second and 25 m in 10th second. Determine

   i) the initial velocity of the body, and

   ii) acceleration of the body. **15**

OR

b) Three perfectly elastic balls A, B and C of masses 2 kg, 6 kg and 12 kg are moving in the same direction with velocities 12 m/s, 4m/s and 2m/s respectively. If the ball A strikes with the ball B, which in turns, strikes with the ball C, prove that the balls A and B will be brought to rest by the impact. **15**

M 26802

Reg. No. : .....

Name : .....

I and II Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, April 2015
(2006 and Earlier Admn.)
CS2K/IT2K 109 : BASIC ELECTRICAL ENGINEERING

Time : 3 Hours Max. Marks : 100

I. a) Explain the terms : charge, current and flux density.

b) What are circuit elements ? Define them and give their units.

c) Explain the concept of impedance.

d) With a suitable example explain poles and zeros.

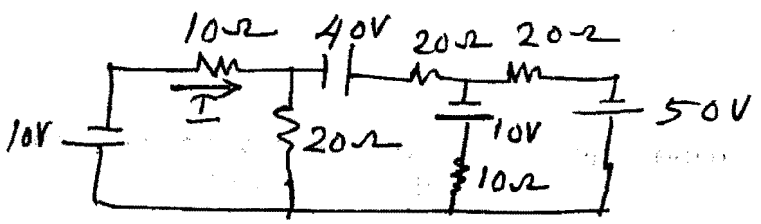
e) Define and explain the regulation of a transformer.

f) Explain the principle of operation of a moving coil instrument.

g) "Synchronous motor is not self starting". Explain why it is not self starting.

h) Explain how torque is developed in DC motor. **(8×5=40)**

II. a) Using super position theorem find the current I in the following circuit :



10

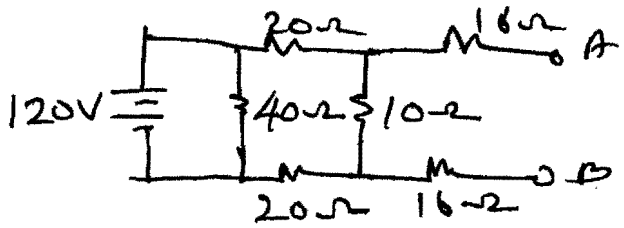
b) Illustrate the method of finding Thevenin equivalent resistance. 5

OR

c) State and explain Norton's theorem. 5

P.T.O.

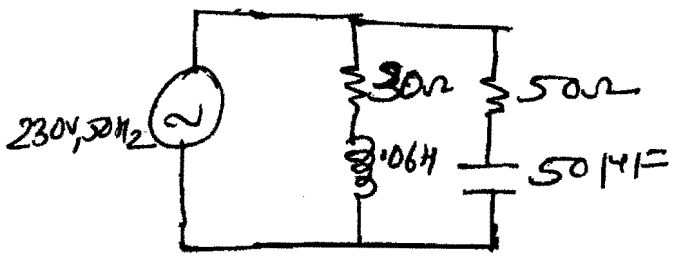
d) Calculate the power which would be dissipated in the 8Ω resistor connected across A and in the following circuit. Use Thevenin's theorem



10

III. a) Explain the concept of poles and zeros. 5

b) Find the total current and power factor of the following circuit. Also find the power absorbed.



10

OR

c) What is meant by forced response ? Derive the unit step response of a second order system. Sketch the time response. 15

IV. a) A 10 KVA, 500/250 V, single phase transformer has its maximum efficiency of 94% when delivering 90% of its rated output at u.p.f. Find its efficiency when delivering its full load at 0.8 pf lagging. 10

b) Explain the theory of wattmeter. 5

OR

c) With neat diagram explain the construction and working of a moving iron instrument. What are the possible errors in this instrument ? 15

V. a) How do you classify d.c. generators ? With diagrams explain the various types of d.c. generators. 8

b) Explain the principle of working of induction motor. 7

OR

c) Discuss about the construction, types and working of alternators. 15

M 26801

Reg. No. : .....

Name : .....

I and II Semester B.Tech. Degree (Reg./Sup./Imp.– Including Part Time) Examination, April 2015
(2006 and Earlier Admn.)
EE2K/EC2K/AI2K 109 : BASIC ELECTRICAL ENGINEERING

Time : 3 Hours Max. Marks : 100

I. a) State and explain Faraday's laws of electro-magnetic induction.

b) With a suitable circuit explain nodal analysis.

c) Explain super position theorem.

d) Obtain the differential equation for RLC series circuit and sketch its step response.

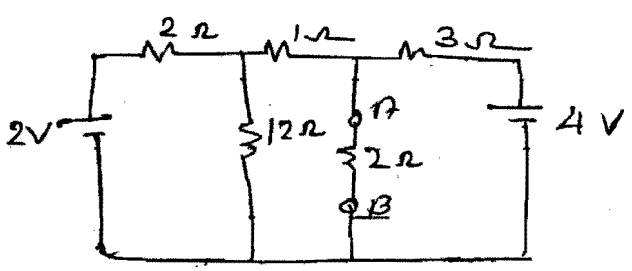
e) A circuit draws a current of 14.4 sin (314t – 20°)A when a voltage of 141.4 sin (314t + 10°) V is applied. Find power and power factor.

f) Find the form factor and peak factor of a triangular wave form.

g) Explain the concept of symmetrical components.

h) Derive the relationship between line and phase voltages of star connected system. **(8×5=40)**

II. a) Find the current in 2Ω resistor connected between A and B in the following circuit. **10**



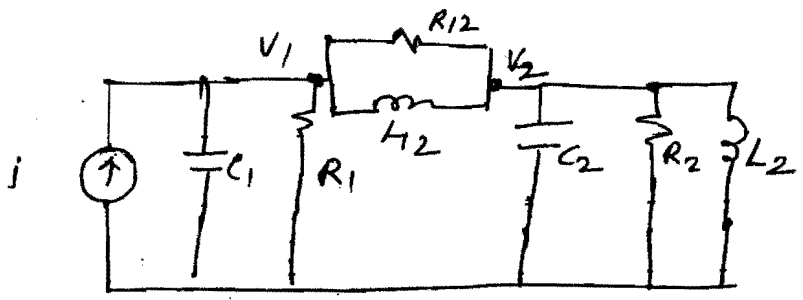
b) State and explain Norton's theorem. **5**

OR

c) An air capacitor has two parallel plates 10 cm^2 in area and 0.5 cm apart. When a dielectric slab of area 10 cm^2 and thickness 0.5 cm was inserted between the plates, one of the plates has to be moved by 4 cm to restore the capacitance. What is the dielectric constant of the slab ? 7

d) Derive expressions for self inductance and mutual inductance. 8

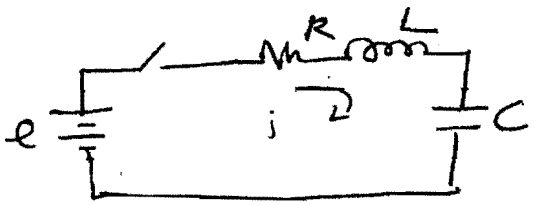
III. a) Obtain the differential equations governing the circuit shown below : 8



b) A 50 Hz sinusoidal voltage of maximum value 400 V is applied to a series circuit of resistance 10Ω and inductance 0.1 H. Find an expression for current at any instant after the voltage is applied. What is its value 0.02 seconds after the switching ON. 7

OR

c) Discuss about the transients in the following circuit. 15



IV.a) A circuit consists of 100Ω resistor, 1H inductance and a capacitor connected in series across 400 V, 50 Hz supply. Find the value of the capacitor to make the current in the circuit 2.5 A. What will be the voltage across the capacitor for this current. 8

b) Discuss about resonance in series RLC circuit. 7

OR

c) Two coils are connected in series across a 240 V, 50 Hz supply one coil has a resistance of 5Ω and the other coil has an inductance of 0.015 H. Input power is 3 kW and KVAR is 2. Find the inductance of the first coil and resistance of second coil. Also find the voltage across each coil. **10**

d) Sketch and explain the frequency response of series RLC circuit. **5**

V. a) With circuit diagram and phasor diagram explain 2 WaH meter method of power measurement in a 3 phase balanced star connected load. Show that the sum of the reading indicated by WaH meters gives the total power whether the load is balanced or not. **15**

OR

b) Write short notes on :

i) Sequence impedance

ii) Star – delta transformation

iii) Sequence coupling. **15**