

## FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2014

## MCA 10 101—DISCRETE STRUCTURES

(2010 Admissions)

Time : Three Hours

Maximum : 100 Marks

*Answer any five questions.  
Each full question carry equal marks.*

- I. (a) Show that  $((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$  is tautology. (10 marks)
- (b) Show that following premises are inconsistent :
- (i) If Jack misses many classes through illness, he fails high school.
  - (ii) If Jack fails high school, then he is uneducated.
  - (iii) If Jack reads a lot of books, then he is not uneducated.
  - (iv) Jack misses many classes through illness and reads a lot of books. (10 marks)
- II. (a) (i) Show that  $A \subseteq A \cup B$  and  $A \cap B \subseteq A$ . (4 marks)
- (ii) Show that  $A \subseteq B \Leftrightarrow A \cup B = B$ . (4 marks)
- (b) A binary string of length 12 is made up of 12 bits (that is 12 symbols, each of which is a 0 or 1). How many such strings either start with three 1's or end in four 0's ? (12 marks)
- III. (a) If  $A = \{1, 2, 3, 4, 5\}$ , give an example of a relation  $R$  on  $A$  that is :
- (i) Reflexive and Symmetric but not transitive.
  - (ii) Reflexive and transitive but not symmetric.
  - (iii) Symmetric and transitive but not reflexive. (12 marks)
- (b) Given  $S = \{1, 2, \dots, 10\}$  and a relation  $R$  on  $S$ , where  $R = \{(x, y) \mid x + y = 10\}$ . What are the properties of relation  $R$  ? (8 marks)
- IV. (a) (i) Show that there exist a one to one mapping from  $A \times B$  to  $B \times A$ . Is it onto ? (6 marks)
- (ii) Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  given by  $f(x) = x^3 - 2$ . Find  $f^{-1}$ . (4 marks)
- (b) Show that the set of real numbers,  $\mathbb{R}$  is not denumerable. (10 marks)

Turn over

- V. (a) (i) Show that in a group  $(G, *)$ , if for any  $a, b \in G$   $(a * b)^2 = a^2 * b^2$ , then P.T.  $(G, *)$  must be abelian. (5 marks)
- (ii) Show that  $(\{1\}, X)$  and  $(\{-1, 1\}, X)$  are the only finite groups of non-zero real numbers under the operation of multiplication. (5 marks)
- (b) Show that every finite group of order  $n$  is isomorphic to a permutation group of degree  $n$ . (10 marks)
- VI. (a) (i) If  $H, K$  one subgroups of a group  $G$ , prove that  $H \cap K$  is also a subgroup of  $G$ . (5 marks)
- (ii) Give an example of a group  $G$  with subgroups  $H, K$  such that  $H \cup K$  is not a subgroup of  $G$ . (5 marks)
- (b) (i) Explain Dihedral group. (6 marks)
- (ii) Show that every subgroup of a cyclic group is cyclic. (4 marks)
- VII. (a) (i) If  $(7, +, \cdot)$  is a field then prove that it is an integral domain. (5 marks)
- (ii) Is every subring an ideal. Justify. (5 marks)
- (b) Prove that  $Z_n$  is a field if and only if  $n$  is prime. Find  $[25]^{-1}$  in  $Z_{72}$ . (10 marks)

**FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2014****MCA 10 102—PROBABILITY AND STATISTICS**

(2010 Admission onwards)

Time : Three Hours

Maximum : 100 Marks

*Answer any five questions.**Each full question carry equal marks.*

- I. (a) Suppose a continuous random variable  $X$  has the probability density  $f(x) = k(1 - x^2)$  for  $0 < x < 1$  and  $f(x) = 0$  otherwise. Find (i)  $k$ ; (ii) mean; and (iii) variance. (10 marks)
- (b) State and prove Chebysheve's inequality. (10 marks)
- II. (a) A manufacturer of electronic equipment subjects samples of two competing brands of transistors to an accelerated performance test. If 45 of 180 transistors of the first kind and 34 of 120 transistors of the second kind fail the test, what can he conclude at the level of significance  $\alpha = 0.05$  about the difference between the corresponding sample proportions? (10 marks)
- (b) On the basis of their total scores, 200 candidates of a civil service examination are divided into two groups, the upper 30% and the remaining 70%. Consider the first question of the examination. Among the first group, 40 had the correct answer, whereas among the second group, 80 had the correct answer. On the basis of these results, can one conclude that the first question is no good at discriminating ability of the type being examined here? (10 marks)
- III. (a) A manufacturer claimed that at least 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample of 200 pieces of equipments received 80 were faulty. Test the claim at 0.05 level. (10 marks)
- (b) A machine puts out 9 imperfect articles. After the Machines is overhauled it puts out 5 imperfect articles in a sample of 700 articles. Test at 5% level whether the machines is improved? (10 marks)
- IV. (a) The rank of 16 students in mathematics and statistics are as follows :  
(1, 1), (2, 10), (3, 3), (4, 4), (5, 5), (6, 7), (7, 2), (8, 6), (9, 8), (10, 11), (11, 15), (12, 9), (13, 14), (14, 12), (15, 16), (16, 13). Calculate the rank correlation for proficiencies of this group in mathematics and statistics. (10 marks)

**Turn over**

(b) Given the bi-variation data :

X : 1 5 3 2 1 1 7 3  
Y : 6 1 0 0 1 2 1 5

- (i) Find the regression line of Y on X and hence predict Y if X = 10.
- (ii) Fit a regression line of X on Y and hence predict X if Y = 2.5.
- (iii) Calculate Karl Pearsons correlation coefficient.

(10 marks)

V. A population consists of five numbers 8, 24, 36, 45, 52. Consider all samples of size two which can be taken without replacement from this population. Find

- (a) The population mean.
- (b) The population standard deviation.
- (c) The mean of the sampling distribution of mean.
- (d) Standard deviation of the sampling distribution of means.

(20 marks)

VI. Write short notes on any *four* of the following :

- (a) Level of significance.
- (b) Bayesian Estimation.
- (c) Ana'ysis of variance.
- (d) Operating characteristic curves.
- (e) Normal approximation to Binomial distribution.
- (f) Weibull distribution.

(20 marks)

VII. A company appoints four salesman A, B, C, D are observes their sales in 3 seasons :

Summer, winter and monsoon. The figures (in lakhs of Rupees) are given in the following table :

Season \ Salesmen	A	B	C	D
Summer	39	30	41	41
Winter	45	40	38	37
Monsoon	43	41	45	38

Carryout an analysis of variance.

(20 marks)

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Name.....

Reg. No.....

**FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2014**

MCA 10(502) — COMPUTER PROGRAMMING  
103  
(2010 Admissions)

Time : Three Hours

Maximum : 100 Marks

*Answer any five questions.  
Each full questions carry equal marks.*

- I. (a) What are the features of a good programme ? (5 marks)  
(b) Discuss in brief the “top down design” and “bottomup design” approach. (5 marks)  
(c) Describe the salient features of modular programming. (10 marks)
- II. (a) Explain about different types of “operators” in C language. (5 marks)  
(b) Write an algorithm and draw the flowchart to check the possibility of constructing a triangle from the given three sides of a triangle. (10 marks)  
(c) Describe four assignment operators. What are the purpose for which they are used ? (5 marks)
- III. (a) Write a note on storage classes. (5 marks)  
(b) Write a C language program to find the ratio between boys and girls in a class. (5 marks)  
(c) Write a C language program to sort a list of names. Also define a function to count the number of vowels in that set of names. (10 marks)
- IV. (a) What is meant by enumerated data types ? Write its application also. (5 marks)  
(b) Compare the structures and unions. (5 marks)  
(c) Write a program to initialise some of the structures of an array of structure and to display the contents of all structures. (10 marks)
- V. (a) Describe different types of inheritance with the help of figures and examples. (10 marks)  
(b) Explain the advantages of object-oriented programming. (10 marks)
- VI. (a) What is meant by constructor ? Explain different types with examples. (10 marks)  
(b) Write short notes on the following :—  
(i) Pointer.  
(ii) Destructors. (10 marks)
- VII. (a) Write a short note on Function Template with the help of examples. (10 marks)  
(b) Write short note on Class templates. (10 marks)

**FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2014****MCA 10 104—LOGIC DESIGN**

(2010 Admisison onwards)

Time : Three Hours

Maximum : 100 Marks

*Answer any five questions.  
All questions carry equal marks.*

1. (a) Write short notes on :
  - (i) Reflected codes. (ii) Hamming code.
  - (iii) Self complementing code. (iv) Gray code.

(10 marks)
- (b) State and explain Boolean Algebra. (10 marks)
2. (a) Using truth table, prove the equivalence of  $p \Rightarrow q$  and  $p' + q$ . (10 marks)
- (b) Obtain the simplified expression and logic circuit using Boolean functions :
  - (i)  $F = x' y' z' + x' y z' + x y' z' + x y z'$ .
  - (ii)  $F = x y' + x y$ .

(10 marks)
3. (a) Simplify the Boolean function F using don't care condition :
  - (i)  $F(x, y, z) = d(6, 7) \Sigma(1, 3, 5)$ .
  - (ii)  $F(a, b, c, d) = d(11, 12, 13, 14, 15) \Sigma(0, 2, 4, 6, 8, 10)$ .

(10 marks)
- (b) What is a K-Map ? Explain in detail with example. (5 marks)
- (c) Explain the use of Flip-flops. (5 marks)
4. (a) Explain Gray Code Counters. (5 marks)
- (b) What is RAM ? Explain it with the logic diagram of a RAM cell. (15 marks)
5. (a) What are Registers ? Explain parallel-in parallel-out and serial-in parallel-out shift registers. (10 marks)
- (b) Explain the working of a synchronous counter with the help of a diagram. (10 marks)

Turn over

6. (a) Explain the features of Assembly Language Programming. (10 marks)  
(b) Explain the Memory and Input/Output interface of 8088 Microprocessor. (10 marks)
7. (a) Explain half-adder and full-adder with the help of a neat diagram. (10 marks)  
(b) Explain various Software and Hardware interrupts of 8088 and 8086 with examples. (10 marks)

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**FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2014**

**MCA 10 105—PRINCIPLES OF SOFTWARE ENGINEERING**

Time : Three Hours

Maximum : 100 Marks

*Answer any five questions.*

*Each full questions carry equal marks.*

1. (a) Explain Software Engineering methods. What are the attributes of a good Software ?  
(b) Explain Spiral Development and Waterfall model. Mention the contexts in which each of them can be suggested for use.
2. (a) Discuss the requirements Engineering Process.  
(b) Summarize the requirements validation techniques.
3. (a) Explain context models and object models using suitable examples.  
(b) What is a Prototype ? What are the uses, advantages and disadvantages of prototypes ?
4. (a) Write on Modular Decomposition.  
(b) Explain Domain specific Architectures.
5. (a) Narrate the characteristics and advantages of Object Oriented Design.  
(b) Discuss the user interface design principles.
6. (a) Explain Object Oriented Testing.  
(b) Outline Software Re-engineering.
7. (a) Present an overview of productivity estimation techniques.  
(b) How does quality reviews ensure Quality Control ? Explain the quality review functions the process.