UKA TARSADIA UNIVERSITY

BCA/Integrated M.Sc. (IT)/MCA (Integrated) (Semester 1)
030010112(2015-16)/060010112(2015-16)/060060109(2015-16)
DSE1 Mathematics For Computer Applications

Date : 21/05/2018   **Time :** 9:30AM- 12:30PM

Max. Marks: 60

Instructions :
1. Attempt all questions.
2. Write each section in a separate answer book.
3. Make suitable assumptions wherever necessary.
4. Draw diagrams/figures whenever necessary.
5. Figures to the right indicate full marks allocated to that question.
6. Follow usual meaning of notations/abbreviations.

SECTION - 1

Q 1 A) Answer the following.   [4]

I) Convert the given binary number 1101.01 into decimal number.

II) Identify whether a statement "If my students climb new rocks in their academic carrier, then I would be the happiest person in this world." is Atomic or Compound statement.

III) Write two applications of hexadecimal number system.

IV) What is the use of existential quantifier?

Q 1 B) Answer the following in brief. (Any 3)   [6]

I) There are 5 operators and 15 characters in the character set of the programming language. How many bits are required to represent each character of the character set?

II) Enlist one difference between Tautology and Contradiction. Using truth table determine the expression $(p \wedge q) \vee \sim (p \wedge q)$ is Tautology or Contradiction.

III) Divide binary number 100011 by 101.

IV) Obtain a disjunctive normal form for the expression $p \wedge (p \rightarrow q)$.

Q 2 Answer the following.   [10]

A) Convert the following arguments into Mathematical form and determine their validity.
   1. If Krishang gets his degree, he will go for a job.
   2. If he goes for a job, he will get married soon.
   3. If he goes for higher study, he will not get married.
   4. Hence, Krishang gets his degree and goes for higher study.

OR

A) Find the DNF or a CNF of the following:

(a) $(p \wedge (p \rightarrow q))$

(b) $q \wedge (p \vee \sim q)$

B) Draw the directed graphs of the relations R = {(1,1), (1,3), (2,1), (2,3),(2,4), (3,1), (3,2), (4,1)} and S = {(1,3), (1,4), (2,1), (2,2), (2,3), (3,1),(3,3), (4,1), (4,3)}. Use these graphs to draw the graphs of (a) R-1 and (b) S'.

OR

B) Draw the Hasse diagram for the "less than or equal to" relation on {0, 2, 5, 10, 11, 15} starting from the digraph.

Q 3 Answer the following in detail. (Any 2)   [10]

I) Given the sets A = {x is multiple of 2, 0 < x < 20} and set B = {x multiple of 3, 0 < x < 20}. Write the members of set A and B. Also perform following operations using Venn diagram.

   i. Intersections of A and B

   ii. Union of A and B

   iii. A – B

   iv. B – A

II) Solve the given binary expression using binary multiplication and division: $[(532)_{10} / (1110)_2]^* [(100001)_2 * (101)_2] / (B)_{16}$

III) If S = {1, 2, 3, 4, 5} and if functions f,g,h: S -> S are given by –
f = {(1,2), (2,1), (3,4), (4,5), (5,3)}
g = {(1,3), (2,5), (3,1), (4,2), (5,4)}
h = {(1,2), (2,2), (3,4), (4,3), (5,1)}

    a. Find f^{-1} and g^{-1}.

    b. Show that $(f \cdot g)^{-1} = g^{-1} \cdot f^{-1} \neq f^{-1} \cdot g^{-1}$

SECTION - 2

Q 4 A) Answer the following. [4]

I) A computer system considers a string of decimal digits to be a valid code word if and only if it contains an even number of zero digits. For instance, 1230407869 is valid, whereas 3141529046 is not. Let Vn be the number of valid n digit code words; find a recurrence for Vn.

II) What is the value of the determinant of 2x2 order and having same value in all raws?

III) Define generating functions.

IV) What is the value of the determinant for Identity matrix?

Q 4 B) Answer the following in brief. (Any 3) [6]

I) Find the value of the equation 3I+5O+5 where determinant is of 3 x 3 order matrix. I indicates the determinant of identity matrix and O indicates determinant of zero matrix.

II) Suppose that a cookie shop has four different kinds of cookies. How many different ways can six cookies be chosen? Assume that only the type of cookie, and not the individual cookies or the order in which they are chosen, matters. There are more than 100 cookies available for each type of cookie.

III)

$$\text{Find} \begin{vmatrix} 1 & -2 & 5 & 2 \\ 0 & 0 & 3 & 0 \\ 2 & -6 & -7 & 5 \\ 5 & 0 & 4 & 4 \end{vmatrix}.$$

IV) Identify the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades A, B, C, D and F.

Q 5 Answer the following. [10]

A)
Verify that for all $n \geq 1$, the sum of the squares of the first 2n positive integers is given by the formula

$$1^2 + 2^2 + 3^2 + \cdots + (2n)^2 = \frac{n(2n+1)(4n+1)}{3}$$

OR

A) In a game, a man wins a rupee for a six and looses a rupee for any other number when a fair Die is thrown. The man decided to throw a die thrice but to quit as and when he gets a six. Find the expected value of the amount he win/looses.

B) Find the equation of the straight line passing through (1, 2) and perpendicular to the line x + y + 7 = 0.

OR

B) Find the distance between the lines 3x + 4y = 9 and 6x + 8y = 15.

Q 6 Answer the following in detail. (Any 2) [10]

I) Explain and show in what ratio the line joining A (5, 12) and B (2,9) is divided by a point P(3,10).

II)

$$\text{Prove that } \begin{vmatrix} (a-1)^2 & (b-1)^2 & (c-1)^2 \\ 1 & 1 & 1 \\ a+1 & b+1 & c+1 \end{vmatrix} = (a-b)(b-c)(c-a)$$

III) A ray of light coming from the point (1, 2) is reflected at a point A on the x-axis and then passes through the point (5, 3). Find the coordinates of the point A.