

Total No. of Questions : 12]

SEAT No. :

[Total No. of Pages : 4

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[5672]-1004

F.Y. MCA (Under Engineering Faculty)

DISCRETE MATHEMATICS

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) a) Define: **[4]**

- i) Union of set
- ii) Complement of set
- b) In a computer laboratory out of 6 computers :

- i) 2 have floating point arithmetic unit.
- ii) 5 have magnetic disk memory.
- iii) 3 have graphics display.
- iv) 2 have both floating point arithmetic unit and magnetic disk memory.
- v) 3 have both magnetic disk memory and graphics display.
- vi) 1 has both floating point arithmetic unit and graphics display.
- vii) 1 has floating point arithmetic, magnetic disk memory and graphics display.

How many have atleast one specification?

OR

Q2) a) Among 100 students, 32 study mathematics 20 study physics, 45 study biology, 15 study mathematics and biology, 7 study mathematics and physics, 10 study physics and biology, 30 do not study any of the three subjects : **[4]**

- i) Find the number of students studying all the three subject
- ii) Find the number of students studying exactly one of the three subjects

b) Prove the following statement by mathematical induction. **[4]**

$$P(n) : 1^3 + 2^3 + \dots + n^3 = n^2(n+1)^2/4$$

P.T.O.

Q3) a) i) Prove that $(p \rightarrow (q \rightarrow r))$ and $((p \rightarrow r) \rightarrow (p \rightarrow q))$ are logically equivalent

ii) Prove that $\sim(p \vee q)$ and $\sim p \wedge \sim q$ are logically equivalent.

[4]

b) Test the validity of argument "If a person is poor, he is unhappy. If a person is unhappy, he dies young. Therefore poor person dies young" **[4]**

OR

Q4) a) Write the following statement in symbolic forms : **[4]**

- i) Indians will win the world-cup if their balling improves.
- ii) Gopal is intelligent but not rich.
- iii) Ram will score good marks in the exam if and only if Ram studies hard.
- iv) It is not true that a three-star rating always means good food and good service.

b) Construct the truth tables to determine whether each of the following is a tautology, a contingency or a contradiction. **[4]**

- i) $(p \wedge (\sim p \vee q)) \wedge \sim q$
- ii) $(\sim p \rightarrow r) \wedge (p \leftrightarrow q)$

Q5) a) A menu card in a restaurant displays 4 soups, five main courses, three desserts and 5 beverages. How many different menus can a customer select if **[5]**

- i) he selects one item from each group without omission?
- ii) he chooses to omit the beverages, but selects one each from the other groups?
- iii) he chooses to omit the desserts but decides to take a beverage and one item each from the remaining groups?

b) In how many ways can one select a president, a General Secretary and a Treasurer from the members of a committee consisting of 9 men and 11 women, if the Treasurer must be a woman and the General Secretary a man? **[4]**

OR

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Q6) a) How many different ways are there to arrange the letters I the word "PROBLEM" if [4]

- i) the letter P must come first?
 - ii) the letter P must come first and the letter M last
- b) How many arrangements of the word INSTRUCTOR are there in which there are exactly 2 consonants between successive pairs of vowels? [5]
- Q7) a) Find the transitive closure of R by Warshall's algorithm, [4]
Where $A = \{1, 2, 3, 4, 5, 6\}$ and $R = \{(x, y) \mid |x - y| = 2\}$
- b) Define with example [4]
i) Many-one function
ii) One-one function

OR

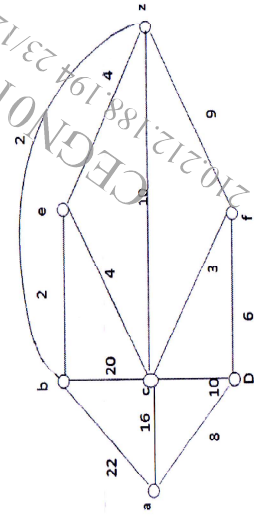
Q8) a) Let $X = \{1, 2, 3, 4\}$ and $R = \{(X, Y) \mid X > Y\}$. Find set of ordered pairs of R. Draw the graph of R and also give its matrix. [4]
b) Explain Pigeonhole Principle. Using pigeonhole principle show that if 7 colors are used to paint 50 bicycles, at least 8 bicycles will have the same color. [4]

Q9) a) Define the following terms : [4]
i) Complete Graph
ii) regular Graph
iii) Eulerian circuit
iv) Complete Bipartite Graph

b) Find all non isomorphic connected graphs with four vertices. [4]

OR

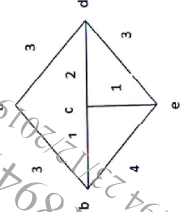
Q10) a) What is the complement of complete bipartite graph $K_{3,2}$? Is it a regular graph? [4]
b) Find shortest path between a-z for the given graph using Dijkstra's algorithm. [4]



Q11) a) for the following set of weights, construct an optimal binary prefix code. For each weight in the set, give the corresponding code word [4]

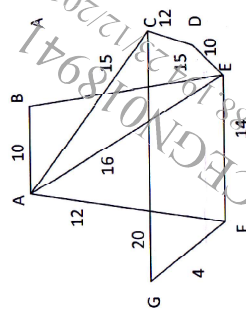
1,2,3,4,5,6,9,10,12

b) Find minimal spanning tree for the following graph by using Prim's algorithm. [5]



OR

Q12) a) Give the stepwise construction of minimum spanning tree for the following graph using Kruskal's algorithm. [5]



b) Find all the spanning trees for the following graph. [4]

