Total No. of Questions : 12]

P778

SEAT No. :

[Total No. of Pages : 4

[6006]-11

F.Y. M.C.A. (Engineering)
DISCRETE MATHEMATICS
(2019 Pattern) (Semester-I) (310901)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:
1) *Neat diagrams must be drawn wherever necessary.*
2) *Figures to the right side indicate full marks.*
3) *Assume Suitable data if necessary.*

Q1) a) Out of a total of 130 students, 60 are wearing hats, 51 are wearing scarves, and 30 are wearing both hats and scarves.

Out of 54 students who are wearing sweaters, 26 are wearing hats, 21 are wearing scarves, and 12 are wearing both hats and scarves. Everyone wearing neither a hat nor a scarf is wearing gloves. **[6]**

i) How many students are wearing gloves?

ii) How many students not wearing a sweater are wearing hats but not scarves?

iii) How many students not wearing a sweater are wearing neither hat nor a scarf?

b) Prove the following statement by mathematical induction. **[6]**

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

OR

Q2) a) 100 Sportsmen were asked whether they play which game : cricket, Hockey, Football. The results are: **[6]**

45 play cricket , 38 play Hockey, 21 play Football, 18 play Cricket and Hockey, 9 play Cricket and Football, 4 play Football and Hockey and 23 play none of these.

Draw a venn diagram that will show the results of the survey and determine the number of sportsmen who play:

i) Exactly one of the games

ii) Exactly two of the games

b) Prove the following expressions using venn diagram. **[6]**

i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

ii) $(A \cap B)' = A' \cup B'$

P.T.O.

Q3) a) Explain the following Terms with Example. **[6]**

   i)   Injective Function

   ii)   Bijective Function

   iii) Surjective Function.

   b) Given a relation R={(1, 2), (2, 3), (3, 4), (2, 1)} on A= {1, 2, 3, 4}. Find the transitive closure of R by Warshall's algorithm. **[6]**

<div align="center">OR</div>

Q4) a) if x = {1, 2, 3.......7} and R = {(x, y) | $x–y$ is divisible by 3}. Show that R is an equivalence relation. Draw the digraph of R. **[6]**

   b) Let f(x) = 2x + 3, g (x) = 3x + 4, h(x) = 4x for x € R, where R= set of all real numbers. Find gof, fog, foh, hof, goh, hog. **[6]**

Q5) a) Two dice are rolled. What is the probability that the sum of the faces will not exceed 7? Given that at least one face shows a 4. **[5]**

   b) A box contains 6 white balls. Find the number of ways, 4 balls can be drawn from the box if **[6]**

   i)   two must be white

   ii)   all of them must have the same colour

<div align="center">OR</div>

Q6) a) How many arrangements of the wordINSTRUCTOR are there in which there are exactly two consonants between successive pairs of vowels?**[6]**

   b) i)   Suppose repetitions are not permitted, then how many 4 digit numbers can be formed from the six digits 1,2,3,5,7,8?

   ii)   How many such a numbers are less than 4000?

   iii) How many numbers in (i) are even?

   iv)   How many numbers in (ii) are odd?

   v)   How many of the numbers in (i) contain both the digits 3 and 5?

<div align="right">**[5]**</div>

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Q7) a) Find Shortest path between A-Z for the given graph; using Dijkstra's algorithm. **[6]**
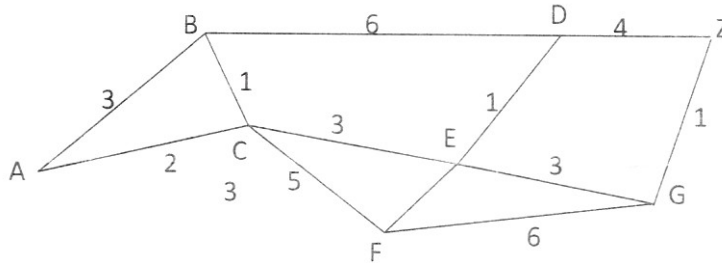
b) Define the following terms: **[6]**

   i) Edge connectivity

   ii) Isomorphic Graph

   iii) Complete Graph

OR

Q8) a) Define Directed Graph with suitable example. **[6]**

b) Determine the number of regions defined by a connected graph with 6 nodes and 10 edges. Draw the graph. **[6]**

Q9) a) A tree has 2n vertices of degree 1, 3n vertices of degree 2 and n vertices of degree 3. Determine the number of vertices and edges in the tree. **[6]**

b) Explain Prim's Algorithm with example. **[6]**

OR

*Q10)*a) Define **[6]**

   i) Full Binary Tree

   ii) Rooted Tree

   iii) Center of tree

   iv) Fundamental cut set

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b) Give the stepwise construction of minimum spanning tree for the following graph using Kruskal's algorithm. **[6]**
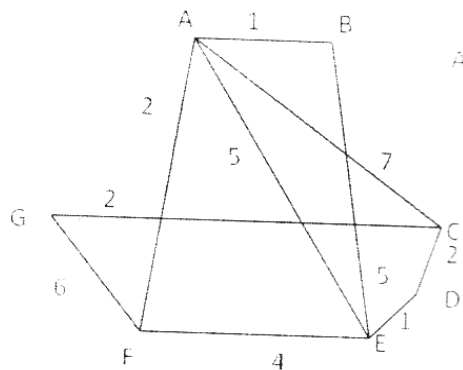
*Q11)*a) Explain the following terms with examples **[6]**

i) Ring

ii) Integral Domain

iii) Field.

b) Let R={0, 60, 120, 180, 240, 300} and*=binary operation so that for a and b in R, a * b is overall angular rotation corresponding to successive rotation by a and by b. Show (R,*) is a group. **[5]**

OR

*Q12)*a) Explain the following terms. **[6]**

i) Monoids

ii) Sub-group

iii) Group codes.

b) Consider the set A ={1, 3, 5, 7, 9,......} i.e. a set of odd positive integers. Determine whether A is closed under : **[5]**

i) Addition

ii) Multiplication

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