**Total No. of Questions : 8]**

**SEAT No. :** 

# PC2835

**[Total No. of Pages :4**

## [6352]-59

## S.E. (Information Technology)

## DISCRETE MATHEMATICS

## (2019 Pattern) (Semester- III) (214441)

***Time : 2½ Hours]*** ***[Max. Marks : 70***

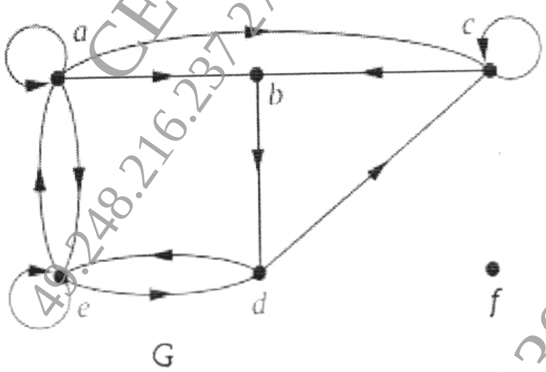
***Instructions to the candidates:***

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

***Q1)*** a) What is a planar graph? Draw planar embedding of K4 and K3,2. **[6]**

b) For the following set of weights construct an optimal binary prefix tree. Find the weight of the optimal tree 2, 3, 5, 7, 9, 13. **[6]**

c) Find the in-degree and out-degree of each vertex in the graph G with directed edges shown in Figure. Show that the sum of In-degree and Out-degree is the same in the graph. **[6]**




OR

***Q2)*** a) Define the following terms **[6]**

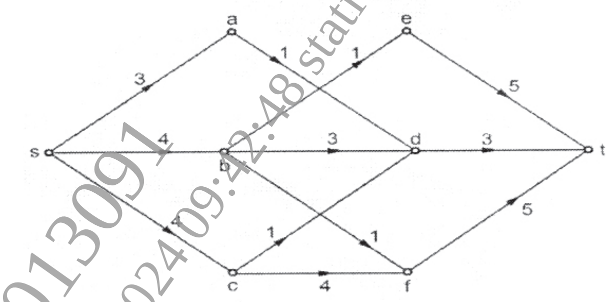
i) Bipartite Graph

ii) Hamiltonian Path

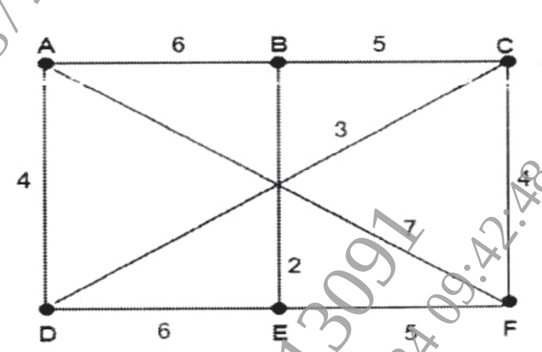
iii) Eulerian Circuit

***P.T.O.***

b) Use the labeling procedure to find a maximum flow in the transport network. Shown in the following fig. **[6]**




c) Determine the minimum spanning tree of the weighted graph shown in fig using Kruskal's Algorithm: **[6]**

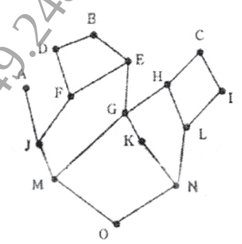



***Q3)*** a) Solve the following recurrence relation. **[6]**

$x_n = 6x_{n-1} - 9x_{n-2}$ where $x_0 = 0$ and $x_1 = 3$

b) Given $f(x) = 2x + 3$ and $g(x) = 3x - 2$. Find $f(4)$, $g(5)$, $gof(x)$ and $fog(x)$. **[6]**

c) Give answers of the following questions w.r.t. Given POSET? **[5]**




What is the upper bound of B?

What is the minimal element?

How many maximal elements are there?

What is the upper bound of M and N?

OR

*Q4)* a) Define POSET. Draw Hasse Diagram for relation R defined over set **[6]**

A={1, 2, 3, 4, 6, 8, 12}  R = {($x$,$y$) | $x$ divides $y$}

b) What is an equivalence relation? Explain with an example. **[6]**

c) Find the minimum number of students in a class such that four of them are born in the same month? (Use PigeonHole Principle) **[5]**

*Q5)* a) Using Binary Expansion method solve the following (Show stepwise answer) 7 ^ 50 mod 13. **[6]**

b) Find the Euler's totient function of the following numbers **[6]**

i) 77

ii) 75

iii) 50

c) Using Chinese Remainder Theorem, find the value of P using following data **[6]**

$P \equiv 3 \pmod 7$

$P \equiv 6 \pmod{11}$

OR

*Q6)* a) Find the multiplicative inverse of 13 mod 31 using Extended Euclidean Algorithm. **[6]**

b) Compute GCD of the following numbers using Euclidean Algorithm **[6]**

i) GCD (1250,900)

ii) GCD (456, 165)

c) Explain Fermat's Little Theorem. Find 3^31 mod 7 using Fermat's Little Theorem **[6]**

*Q7)* a) Let P be the set of all matrices of the form [[$x$ $x$],[$x$ $x$]] where $x$ is a non-zero rational number. * is the matrix multiplication defined over P. Show that it is a group. **[6]**

b) Explain Integral Domain with an example. **[6]**

c) Let S={1, 2, 3, 6, 12}, where a*b is defined as LCM (a,b) over set S. Determine whether it is a semigroup, group, or Abelian Group or neither. **[5]**

OR

***Q8)*** a) Prove that Z={1, 5, 7, 11} is an Abelian group under multiplication mod 12. **[6]**

b) Let I be the set of all positive integers. For each of the following determine * is a commutative operation or not: **[6]**

i) a * b = max (a, b)

ii) a * b = (a + b)/2

iii) a * b = a.b (Multiplication)

iv) a * b = power (a,b)

v) a * b = 2a/b

vi) a * b = 2a + b

c) Find the minimum distance of an encoding function **[5]**

$e:B^2 \rightarrow B^5$ given as: e(0, 0) = 00000, e(0, 0) = 10011, e(0, 0) = 01110, (0, 0) = 11111.