Total No. of Questions: 8]

SEAT No. :

PA-1242

[Total No. of Pages : 4

[5925]-265

S.E. (IT)

DISCRETE MATHEMATICS

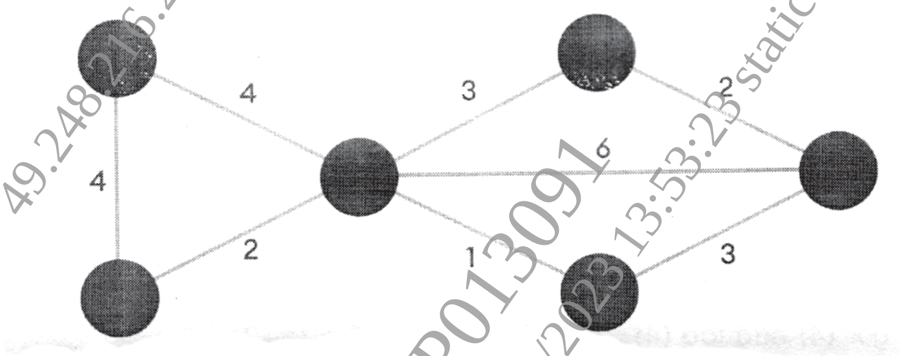
(2019 Pattern) (Semester-III) (214441)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

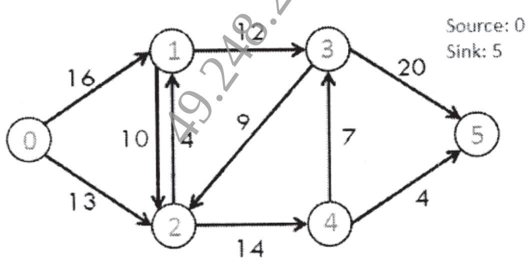
1) *Answer Q.1, or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Figures to the right indicate full marks.*

Q1) a) Find the Shortest Path algorithm using Dijikstra's Shortest path algorithm. **[6]**



b) Construct an optimal tree for the weights 3, 4, 5, 6, 12 Find the weight of the optimal tree. **[6]**

c) Find the maximum flow for the following transport network. **[6]**



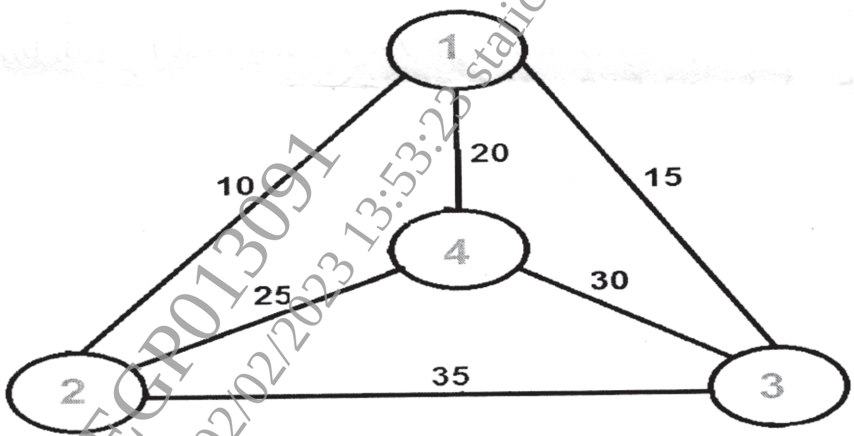
OR

Q2) a) Define Following with examples: **[6]**

i) rooted tree
ii) Spanning tree
iii) Binary Tree

P.T.O.

b) Use nearest Neighbourhood method to solve Travelling Salesman problem. **[6]**



c) Explain Hamiltonian and Euler path and circuits with example. **[6]**

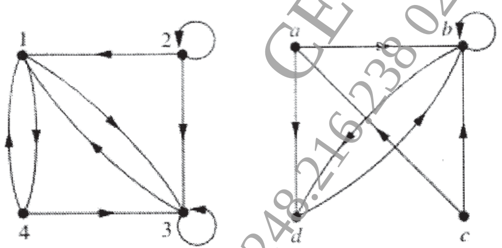
Q3) a) X = {2, 3, 6, 12, 24, 36} and x<=y iff x divides y. Find **[6]**

i) Maximal Element

ii) Minimal Element

iii) Draw the graph and its equivalent hasse diagram for divisibility on the set: {2, 3, 6, 12, 24, 36}.

b) What are the ordered pairs in the relation R represented by the directed graph shown in below Figures? **[6]**



c) Let functions f and g be defined by **[5]**

$$f(X) = 2X+1, g(X) = X^2 - 2$$

Find

i) gof (4) and fog (4)

ii) gof (a+2) and fog (a+2)

iii) fog (5)

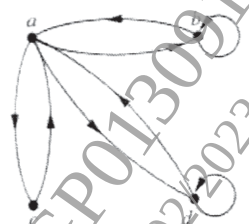
iv) gof (a+3)

v) gof (a+4)

OR

Q4) a) What is the reflexive closure of the relation R = {(a, b) | a<b} on the set of integers and symmetric closure of the relation R = {(a,b) | a>b} on the set of positive integers? **[6]**

b) Determine whether the relations for the directed graphs shown in Figure are reflexive, symmetric, antisymmetric, and/or transitive. **[6]**



c) Let *X* = {a, b, c). Define *f*: *X*->X such that f ={(a,b), (b, a), (c, c)} **[5]**
Find

i) f^{-1}

ii) f^{-1} of

iii) fof^{-1}

Q5) a) Solve the congruence 8x = 13mod 29 **[6]**

b) For each pair of integer a and b, find integers q and r such that a = bq + r such that 0 <= r <|b|, where a is dividend, b is divisor, q is quotient and r is remainder. **[8]**

i) a = -381 and b=14

ii) a = -433 and b = -17

c) Find all positive divisors of **[4]**

i) 256 = 28

ii) 392 = 23. 72

OR

Q6) a) Which of the following congruence is true? Justify the answer. **[6]**

i) 446 ≡ 278 (mod 7)

ii) 793 ≡ 682 (mod9)

iii) 445 ≡ 536 (mod 18)

b) Compute GCD of the following using Euclidian algorithm. **[6]**

i) GCD (2071, 206)

ii) GCD (1276, 244)

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

p=2 mod 3

p=2 mod 5

p=3 mod 7

Q7) a) Let R = {0o, 45o, 90o, 135o, 180o, 225o, 270o, 315o} and *= binary operation, so that a*b is overall angular rotation corresponding to successive rotations by a and then by b. Show that (R,*) is a Group. **[9]**

b) Let l be the set of all integers. For each of the following determine whether *is an commutative operation or not: **[8]**

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

ii) a*b=min(a+2,b)

iii) a*b=2a-2b

iv) a*b= min (2a-b, 2b-a)

v) a*b= LCM (a,b)

vi) a*b=a/b

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

viii) a*b=a 2 + 2b+ab

OR

Q8) a) Show that set G of all numbers of the form a+b √ 2, a, b ∈l forms a group under the operation addition i.e.(a+b √ 2) + (c+√ d 2) = (a+c) + (b+d) √2. **[9]**

b) Determine whether the set together with the binary operation is a semigroup, group a monoid, or neither.

S= {1, 2, 5, 10, 20}, where a*b is defined as GCD (a,b) **[8]**