

Seat  
No.

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Bll1301

## Discrete Structure & Graph Theory (New) (1020)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** subquestions out of 3 subquestions for each unit.
5. Assume suitable data wherever necessary.
6. Draw neat diagrams wherever necessary.

### UNIT - I

1. a) Among the integers 1 to 1000.
  - i) Find how many of them are not divisible by 3, nor by 5, nor by 7.
  - ii) Also find, how many are not divisible by 5 and 7 but divisible by 3. **10**
- b) i) Show that  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$  for  $n \geq 1$ . **5**
  - ii) Explain propositions and combination of propositions. **5**
- c) i) In an organisation, 40% employee play cricket, 50% employee play Hockey, and 25% employee play both games. Then find probability that employee play Hockey only, employee play cricket only, employee takes part in at least 1 game. **5**
  - ii) State and prove properties of set operations with suitable venn diagrams. **5**

### UNIT - II

2. a) Define transitive closure. State and explain the steps or algorithm of Warshall's to find the transitive closure. Also justify the same for following example.  
let, set  $A = \{p, q, r, s, t\}$   
and  $R = \{(p, s), (q, p), (q, t), (q, s), (s, r), (t, r), (r, q)\}$  **10**

- b) i) What is partial order relation. Justify it for following example.

let  $A = \{a, b, c, d, e\}$

and  $R = \{(a, a), (a, b), (a, c), (a, d), (a, e),$   
 $(b, b), (b, c), (b, e), (c, c), (c, e),$   
 $(d, d), (d, e), (e, e)\}$

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- ii) Define the explain function with suitable example.

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- c) i) Define and explain lattice with suitable example.

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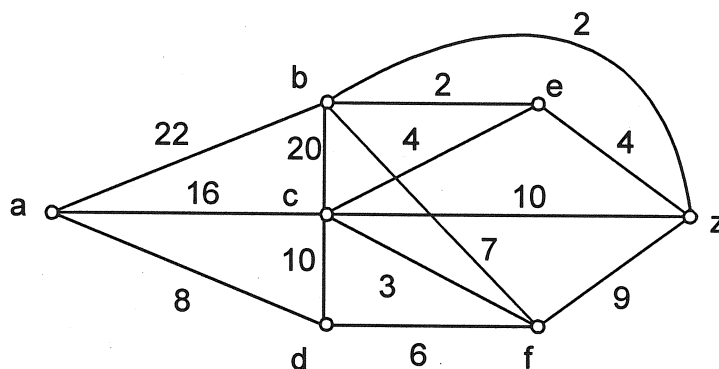
- ii) Define and explain recurrence relation with suitable example.

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### UNIT - III

3. a) Find the shortest path using Dijkstra's algorithm between vertex a and z.

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- b) i) Explain Prim's algorithm for minimum spanning tree with example.

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- ii) Explain Huffman's algorithm for optional binary tree with example.

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- c) i) Define and explain Euler's path and circuit with example.

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- ii) Define and explain complete bipartite graph with example.

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### UNIT - IV

4. a) Explain the terms isomorphism, automorphism, Homomorphism with proper example of each.

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- b) Explain time complexity of algorithm. Write the shortest path algorithm. Also justify its time complexity.

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- c) i) Show that the set of integers of the form  $3m+1$  is closed under multiplication. Is this set a submonoid of  $(\mathbb{Z}, \times)$ . 5
- ii) Explain the terms group and Abelian group with suitable example. 5

### UNIT - V

5. a) Perform the following conversions. 10
- i)  $(61.78)_{10} = ( )_2$
- ii)  $(BA_4)_{16} = ( )_{10}$
- iii)  $(1011011)_2 = ( )_{10}$
- iv)  $(2347)_8 = ( )_{10}$
- v)  $(2EA)_{16} = ( )_8$
- b) i) Prove that in a distributive lattice, if an element has a complement, then this complement is unique. 5
- ii) Explain principle of duality with example. 5
- c) i) Prove that for  $a$  and  $b$  in a boolean algebra
- $$\overline{a \vee b} = \bar{a} \cap \bar{b}$$
- $$\overline{a \cap b} = \bar{a} \vee \bar{b}$$
- 5
- ii) Prove that both join and meet operations are commutative as well as associative. 5

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