

M.C.A. - I (2 Years) New CBCS Pattern Semester-I
PSMCAT104.2 - Paper-IV : Elective-II : Discrete Mathematics

P. Pages : 2

Time : Three Hours



GUG/W/23/13639

Max. Marks : 80

- Notes :
1. All questions are compulsory and carry equal marks.
 2. Draw neat and labelled diagram wherever necessary.
 3. Avoid vague answers and write answers relevant and specific to question only.

Either:

1. a) What do you mean by normal form? Explain Disjunction & Conjunctive normal form with suitable example. 8
- b) Verify the equivalence, 8
 $\neg A \Leftrightarrow A^* (\neg P_i)$ where, A (P, Q, R) is $\neg P \wedge \neg(Q \wedge R)$

OR

- c) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S), \neg R \vee P$ and Q. 8
- d) Suppose A, B, C are matrices then prove that 8
- i) $A(B+C) = AB+AC$
- ii) $(AB)C = A(BC)$

Either:

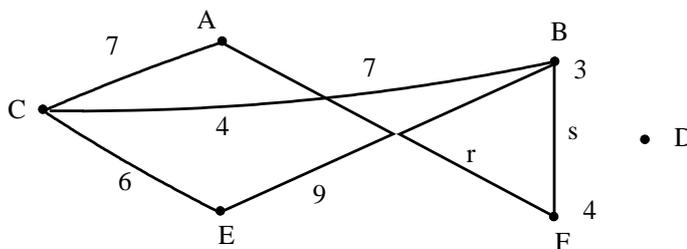
2. a) Let $A = \mathbb{Z}^*$, the set of positive integer and let $R = \{(a, b) \in A \times A \mid a \text{ divides } b\}$ is R symmetric, asymmetric or antisymmetric? 8
- b) Determine the value of 'n' if- 8
- i) $6 \times {}^n P_3 = 3 \times {}^{n+1} P_3$
- ii) $3 \times {}^n P_4 = 7 \times {}^{n-1} P_3$

OR

- c) State and prove pigeonhole principle with example. 8
- d) Let $A = \{a, b, c, d, e\}$ & 8
 $R = \{(a, a), (a, b), (b, c), (c, e), (c, d), (d, e)\}$
compute (a) R^2 (b) R^∞ .

Either:

3. a) Find a minimum spanning tree of following weighted connected graph. 8



- b) What do you mean by Hasse Diagram? Determine the Hasse diagram of the relation R on set A.
 $A = \{1, 2, 3, 4\}$ and $R = \{(1,1), (1,2), (2,2), (2,4), (1,3), (3,3), (3,4), (1,4), (4,4)\}$ 8

OR

- c) Show that, in a lattice, if $a \leq b \leq c$ then 8
- i) $(a \oplus b) = (b * c)$
- ii) $(a * b) \oplus (b * c) = b = (a \oplus b) * (a \oplus c)$
- d) Prove that: 8
 $a \cdot (b + c) = a \cdot b + a \cdot c$

Either:

4. a) Let $V = \{V_0, w, a, b, c\}, S = \{a, b, c\}$ & Let \mapsto be the relation on V^* given by 8
- i) $V_0 \mapsto aW$ ii) $U_0 \mapsto bbW$
- iii) $W \mapsto C$
- Find $L(G)$ & derivation tree for it.

- b) Let T be set of all even integers. Show that the semigroup $(Z, +)$ and $(T, +)$ are isomorphic. 8

OR

- c) Consider the binary operation $*$ on Q , the set of rational number defined by 8
 $a * b = a + b - ab \forall a, b \in Q$. Determine whether $*$ is associated.
- d) Explain the following terms: 8
- i) Idempotent ii) Distributivity
- iii) Inverse iv) Identity

5. Attempt all the questions.
- a) Write a short note on Principle Conjunctive Normal form. 4
- b) Prove that $(P \rightarrow Q) \leftrightarrow (\neg P \rightarrow \neg Q)$ is a tautology. 4
- c) Write a short note on Boolean Polynomial with example. 4
- d) Let $S = \{a, b, c\}$. Draw the Hasse diagram of $(P(S), \subseteq)$. 4
