

M.C.A.- I (Two Year Programme) (CBCS Pattern) Sem-I  
**PSMCAT104.2 - Paper-IV - Elective-II : Discrete Mathematics**

P. Pages : 2

Time : Three Hours



**GUG/W/22/13639**

Max. Marks : 80

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

Either:

1. a) If A and B are matrices then prove that. 8
- i)  $(A+B)^T = A^T + B^T$
  - ii)  $(AB)^T = B^T + A^T$

- b) Obtain conjunctive Normal form of formula s given by  $(\neg P \rightarrow R) \wedge (Q \leftrightarrow R)$  8

**OR**

- c) Define following terms with truth table. 8
- i) Negation
  - ii) Conjunction
  - iii) Disjunction
  - iv) Conditional statement.

- d) Show that  $R \leftrightarrow S$  can be derived from the premises  $P \rightarrow (Q \rightarrow S), \neg R \vee P$  and  $Q$ . 8

Either:

2. a) How many distinguishable permutation of the letter in the word: 8
- i) BANANA
  - ii) HIPPOPOTAMOUS
  - iii) REQUIREMENTS
  - iv) APPLE

- 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) Determine value of the following. 8

- i)  ${}^{10} C_6$
- ii) Find value of n :  ${}^n C_{n-2} = 10$
- iii)  $5^2 p_4$

- d) Determine the No. of Permutations that can be made out of word. 8

- i) PARAMETERS
- ii) ACCREDITATION
- iii) PROCESS

Either:

3. a) Simplify the following expression. 8  
i)  $(a * c) \oplus c \oplus [(b \oplus b') * c]$   
ii)  $(a * b' * c) \oplus (a * b' * c) \oplus (a * b' * c)'$

- b) Consider a lattice  $(L, *, \oplus)$  and  $a, b, \in L, a \leq b$  then set  $\{x \in L \mid a \leq x \leq b\}$  becomes a sub lattice. 8

**OR**

- c) Construct tree. 8  
i)  $(3 * (1 - x)) \div ((4 + (y + 2))) * (7 + (z \div y))$   
ii)  $((2 + x) - (2 * x)) - (x - 2)$

- d) Define the following. 8  
i) Partial Order Set.  
ii) Total Order Set.  
iii) Eulerian Graphs.  
iv) Hasse Diagram with example.

Either:

4. a) Define derivation Tree with all its tuples and give an example of. 8  
i) Right most derivation  
ii) Left most derivation  
iii) Parse tree.

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

**OR**

- c) Consider an algebraic system  $(Q, *)$  where Q is a set of rational no. and \* is a binary operation defined by  $a * b = a + b - ab \forall a, b \in Q$  Determine  $(Q, *)$  is a Group. 8

- d) Explain classification of phase structure Grammar (All 4 types): Also give examples of each. 8

5. Attempt all the questions. 4  
a) Obtain the principle disjunctive normal form of  $\neg P \vee Q$ . 4  
b) Write a short note on Relations & Digraphs with example. 4  
c) Let  $s = \{a, b, c\}$ . Draw the Hasse diagram of  $(P(s), \subseteq)$ . 4  
d) Write a short note on Moore Machine. 4

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