

**PJ-582**

1 Semester M.C.A. Examination, February - 2020
(CBCS Scheme)

COMPUTER SCIENCE

MCA - 104T : Discrete Mathematics

Time : 3 Hours

Max. Marks : 70

PART - A

Answer any five questions. Each question carries six marks.

5×6=30

1. (a) Suppose $A, B \subseteq \mathbb{Z} \times \mathbb{Z}$ with $A = \{(x, y) | y = 5x - 1\}$, $B = \{(x, y) | 3x - y = -7\}$. Find $\overline{A \cup B}$. 3+3
(b) For any set A , prove that $A \times \phi = \phi \times A = \phi$.
2. (a) Let $A = \{1, 2, 3, 4, 6, 8, 12\}$. On A , define the partial ordering relation R by xRy if and only if x divides y . Draw the Hasse diagram for R . 3+3
(b) Let $f, g : \mathbb{R} \rightarrow \mathbb{R}$, are defined by $f(x) = 3x + 7$ and $g(x) = x(x^2 - 1)$ for all $x \in \mathbb{R}$. Verify that f is one-one but g is not.
3. Use mathematical induction to prove that $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ where $n \in \mathbb{Z}^+$. 6
4. Prove that $R \rightarrow S$ is a valid conclusion from the premises $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$, and Q . 6
5. A collection of 10 electric bulbs contain 3 defective ones. 2+2+2
(i) In how many ways can a sample of 4 bulbs be selected ?
(ii) In how many ways can a sample of four bulbs be selected which contain 2 good ones and 2 defective ones ?
(iii) In how many ways can the sample of 4 bulbs be selected so that either the sample contains 3 good ones and 1 defective ones or 1 good and 3 defective ones ?
6. Show that the open interval $(0, 1)$ is uncountable. 6
7. Prove that every set of 37 positive integers contain at least two integers that leave the same remainders upon division by 36. 6

P.T.O.

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