

**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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**Hongru Du**



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