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PJ-582

I 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. **5x6=30**

1. (a) Suppose $A, B \subset \mathbf{Z} \times \mathbf{Z}$ with $A=\{(x, y) \mid y=5x-1\}$, $B=\{(x, y) \mid 3x-y=-7\}$. 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 $f, g : \mathbf{R} \to \mathbf{R}$, are defined by $f(x)=3x+7$ and $g(x)=x(x^3-1)$ for all $x \in \mathbf{R}$. Verify that f is one-one but g is not.

3. Use mathematical induction to prove that $1^2+2^2+3^2+\ldots+n^2=\frac{n(n+1)(2n+1)}{6}$, where $n \in \mathbf{Z}^+$. **6**

4. Prove that $R \to S$ is a valid conclusion from the premises $P \to (Q \to S)$, $\neg R \vee P$, 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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