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. $5 \times 6 = 30$

1. (a) Suppose A, B $\subseteq$ **Z**$\times$**Z** with $A = \{(x, y)|y = 5x - 1\}$, $B = \{(x, y)|3x - y = -7\}$. **3+3** Find $\overline{A \cup B}$.

   (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 **3+3** by xRy if and only if x divides y. Draw the Hasse diagram for R.

   (b) Let $f, g : \mathbf{R} \to \mathbf{R}$, are defined by $f(x) = 3x + 7$ and $g(x) = x(x^2 - 1)$ for all $x \in \mathbf{R}$. Verify that f is one-one but g is not.

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

4. Prove that $R \to S$ is a valid conclusion from the premises $P \to (Q \to S)$, $\neg R \vee P$, **6** and Q.

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 **6** leave the same remainders upon division by 36.

P.T.O.

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