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MCS-013

M. C. A./B. C. A. REVISED (MCA/BCA)

Term-End Examination

June, 2020

MCS-013 : DISCRETE MATHEMATICS

Time : 2 Hours *Maximum Marks : 50*

Note : *Question No. 1 is compulsory. Attempt any* ***three*** *questions from the rest.*

1. (a) Check whether the following formula is tautology, contradiction or contingency : 5

$$\sim ((P \rightarrow Q) \rightarrow ((R \vee P) \rightarrow (R \vee Q)))$$

(b) Two finite sets have x and y number of elements. The total number of subsets of the first set is four times the total number of subsets of second set. Find out the value of $x - y$. 4

P. T. O.

(c) In a group of 400 people 250 can speak in English only and 70 can speak Hindi only. 3

(i) How many can speak English ?

(ii) How many can speak Hindi ?

(iii) How many can speak both English and Hindi ?

(d) If $f : A \to B$ and $g : B \to C$ are injective function, then $g \circ f : A \to C$ is an injective function. Prove or disprove. 3

(e) Use the method of proof by contradiction to show that $x \in R$ if $x^3 + 4x = 0$, then $x = 0$. 3

(f) Three persons enter in a railway compartment. If there are 5 seats vacant, in how many ways they can take these seats ? 2

2. (a) Given : 5

$$A = \{1, 3, 5, 7\}$$

$$B = \{2, 3, 5, 8\}$$

(i) List the elements of $(A \times B) \times (B - A)$.

(ii) Is $(A \times B) \times (B - A)$ a subset of $A \times B$?

(b) Prove that : 5

$$^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r} \, (0 \leq r \leq n).$$

3. (a) Show that in any set of eleven integers there are two which are divisible by 10, by applying pigeonhole principle. 3

(b) How many solutions are there of : 4

$$x + y + z = 17$$

subject to the constraints :

$$x \geq 1$$

$$y \geq 2$$

$$z \geq 3.$$

(c) If : 3

$$P(A) = \frac{1}{4}$$

$$P(B) = \frac{2}{5}$$

and $P(A \cup B) = \frac{1}{2}$

find :

(i) $P(A \cap B)$

(ii) $P(A \cap B')$

4. (a) Five balls are drawn from a bag containing 6 white and 4 black balls. What is the probability that 3 are white and 2 black ? 3

(b) From the digit 1, 2, 3, 4, 5, 6, how many three digit odd numbers can be formed when

(i) repetition of digit is allowed ? 2

(ii) repetition of digit is not allowed ? 2

(c) How many numbers divisible by 2 lying between 50,000 and 70,000 can be formed from the digits 3, 4, 5, 6, 7, 8, 9, no digit being repeated in any number. 3

5. (a) Show that : 4

$$1.2 + 2.3 + \ldots\ldots n(n+1) = \frac{n(n+1)(n+2)}{3}$$

(b) Write the negation of the following statement : 2

If it is raining, then the game is cancelled.

(c) Draw the circuit represented by the following Boolean function : 4

$$f : xy + \bar{x}y$$