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A-1710

B. Sc. (IT) (Sem. I) Examination

March / April – 2015

Mathematics - I

Time : **3** Hours] [Total Marks : **70**

Instructions : (1)

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Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ **B. SC. (IT) (SEM. 1)**

Name of the Subject :
☛ **MATHEMATICS - 1**

☛ Subject Code No. : **1 7 1 0** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Follow usual notation

(3) Attempt **all** questions.

1 (a) Attempt any **two** : **8**

(1) Define composition of relations. Let $A=\{1, 2, 3\}$, $B=\{a, b, c\}$ and $C=\{x, y, z\}$ and consider the relation $R=\{(1, b), (2, a), (2, c)\}$ from A to B and the relation $S=\{(a, y), (b, x), (c, y), (c, z)\}$ from B to C. Find the composition relation $R^\circ S$.

(2) Consider the relation $R=\{(a, b), (a, c),(c,c), (b, b), (c,b),(b,c)\}$ on the set $A=\{a, b, c\}$. Is R reflexive ? Symmetric ? Transitive ? If a property does not hold, say why.

(3) Suppose R is an equivalence relation on a set A. Suppose $a, b \in A$. Then $[a]=[b]$ if and only if aRb.

(b) Attempt any **three** : **9**

(1) Let $A=\{a, b\}$, $B=\{1, 2\}$ and $C=\{2, 3\}$. Find

(a) $(A \times B) \cap (A \times C)$

(b) $A \times (B \cap C)$.

(2) Let I be the set of positive integers. Let $\equiv m$ be the congruence modulo m relation on I. Show that it is transitive.

(3) Let R be the set of real numbers. Define a binary operation $*$ on R as $a * b = a + b + ab.\ \forall\ a, b \in R$. Find the inverse of 20.

(4) Prove that the composition of two relations is associative but not commutative.

2 (a) Attempt any **three** : **9**

(1) Prove that the function f is invertible if f is one-to-one and onto.

(2) Given the function $f(x) = 2x + 1$ and $g(x) = x^2 - 2$. Find $(f^\circ f)$ and $(g^\circ g)$.

(3) Let f be a function. Let Q be the set of rational numbers. If $Df \subseteq Q$, $Rf = \{-5, 1\}$ and $f(x) = 4x^2 - 3x - 6$ then find all possible domains of f.

(4) Define the following terms :

(i) Function

(ii) Onto function

(iii) Composition of two functions.

(5) In the usual notations prove that $(\aleph_{A \cap B}) = Min.\ (\chi_A, \chi_B)$.

(b) Attempt any three : **9**

(1) Define the following giving one illustration to each.

(i) Conjugate of a matrix

(ii) Skew-symmetric matrix

(iii) Hermitian matrix.

(2) Let $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ find A^2, A^3 and $(S * A)$ where $S = \begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix}$.

(3) For the Matrices $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 4 \\ 6 & 11 \end{bmatrix}$ prove that $AB = BA$.

(4) Express the square matrix $A=\begin{bmatrix} 1+i & 2i & -3 \\ 2+i & 6 & 2-3i \\ 4+3i & 0 & 1-3i \end{bmatrix}$ as the sum of a Hermitian matrix and a Skew-Hermitian matrix.

(5) Show that $A=\begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$ and $B=\begin{bmatrix} -11 & 2 & 2 \\ -4 & 0 & 1 \\ 6 & -1 & -1 \end{bmatrix}$ are inverses of each other.

3 (a) Define : Harmonic mean, Median and Mode. 3

OR

(a) Define : 3

(i) Standard Deviation

(ii) Quartile Deviation

(iii) Range.

(b) Find mean, median, mode and D_4 from the following data : 5

Class :	0-10	10-20	20-30	30-40	40-50	50-60
Frequency (f) :	5	6	11	21	13	4

OR

(b) Find Quartile Range and Mean Deviation about mode from the following data : 5

Class :	0-10	10-20	20-30	30-40	40-50	50-60
Frequency (f) :	4	6	20	10	7	3

(c) Find Harmonic mean and standard deviation from the following data : 5

Class :	12-13	13-14	14-15	15-16	16-17	17-18
Frequency (f) :	15	30	45	60	10	10

4 (a) Define : 3

(i) Sample space

(ii) Mutually exclusive events

(iii) Exhaustive events.

OR

(a) (i) State Baye's theorem on probability. 3

(ii) Mathematical definition of probability.

(iii) Independent events.

(b) Attempt any **two** : **8**

(i) If $P(A)=0.6$, $P(B)=0.2$ and $P(A/B)=0.2$ then find $P(A \cup B')$, $P(B/A)$ and $P(A' \cup B')$.

(ii) In a group of 8 children consisting of 5 boys and 3 girls, 3 children are selected at random. Then what is the probability that in a group,
(1) 1 girl (2) 1 boy (3) at least one girl.

(iii) Three bags have the following nos. of balls. one bag is selected at random 2 balls are drawn. from it, they happen to be one white and one red. What is the probability that they are coming from bag - I ?

Bag	White	Red	Black
I	2	3	1
II	3	2	2
III	4	3	1

5 (a) State the probability function of Binomial distribution and obtain its mean. **3**

OR

(a) State the probability function of Poisson distribution and obtain its variance. **3**

(b) Attempt any **two** : **8**

(1) The p.f. of a r.v. x is :

x :	0	1	2	3
$p(x)$:	0.1	k	0.2	0.4

Find (i) constant k (ii) $E[3x-5]^2$.

(2) For Binomial distribution with $n = 6$, $3\,P(x = 2) = 2\,P(x = 3)$ then find $P(x = 0)$ and $P(x \geq 5)$.

(3) For Poisson distribution if $P(x = 0) = P(x=1)$ then find $P(x = 3)$ and $P(x > 2)$.