



DE-1710

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

March / April - 2016

102 : Mathematics - I

Time : Hours]

[Total Marks : 70

Instructions :

(1)

नीचे दृष्टविक निशानीवाणी विगतो उत्तरवडी पर अवश्य कपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. SC. (I.T.) (SEM. I)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="102 : Mathematics - I"/>	<input type="text"/>
Subject Code No. : <input type="text" value="1"/> <input type="text" value="7"/> <input type="text" value="1"/> <input type="text" value="0"/>	Section No. (1, 2,.....) : <input type="text" value="Nil"/>
Student's Signature	

- (2) Answer all questions.
(3) Follow usual notation.
(4) Figures to the right indicates marks of the questions.

- 1 (a) Answer any two : 8
- (i) Let R^{-1} be the converse relation of the relation R . Prove that the domain of $R =$ the range of R^{-1} and the range of $R =$ the domain of R^{-1} .
- (ii) Consider the relation $R = \{(a,a), (b,b), (c,c), (d,d), (a,b), (b,a)\}$ on set $A = \{a,b,c,d\}$. Is R reflexive ? Symmetric ? Transitive ? If a property does not hold, say why.
- (iii) Define : Equivalence classes. Prove that any two equivalence classes are either identical or disjoint.
- (b) Attempt any three : 9
- (i) Prove that
- (a) $(A \times B) \cap (A \times C) = A \times (B \cap C)$
- (b) $(A \times B) \cup (A \times C) = A \times (B \cup C)$
- (ii) Let $P(A)$ be the power set of A . Let \subseteq (inclusion) be a relation on $P(A)$. Show that it is reflective and anti-symmetric.
- (iii) Let R be the set of real numbers. Define a binary operation $*$ on R as $a * b = b$. Show that it is associative. Find the identity element if it exists.

- (iv) 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 12.

2 (a) Attempt any three :

9

- (i) Prove that the function f is invertible if f is one-to-one and onto.
- (ii) Given the function $f(x) = 2x + 1$ and $g(x) = x^2 - 9$. Find $(f \circ f)$ and $(g \circ g)$
- (iii) Define the following terms :
- (i) Function
 - (ii) One one function
 - (iii) Composition of two functions
- (iv) Let $f : R \rightarrow R$ be a function defined as $f(x) = 3x + 5$. Prove that f is one-to-one and onto and hence find the inverse of f .
- (v) In the usual notations prove that $(\aleph_{A \cap B}) = \text{Min}(\aleph_A, \aleph_B)$.

(b) Attempt any three :

9

- (i) Define the following giving one illustration to each.
- (i) An upper triangular matrix
 - (ii) Skew-symmetric matrix
 - (iii) Hermitian matrix

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

$$S = \begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix}$$

- (iii) Prove that for the Matrices $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and

$$B = \begin{bmatrix} 5 & 4 \\ 6 & 11 \end{bmatrix} \text{ is commutative.}$$

- (iv) Find the inverse of the following matrix A using elementary row transformations.

$$A = \begin{bmatrix} 2 & 2 & -2 \\ -2 & 5 & 0 \\ 0 & -6 & 3 \end{bmatrix}$$

(v) Show that $A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} -11 & 2 & 2 \\ -2 & 0 & 1 \\ 6 & -1 & -1 \end{bmatrix}$

are inverses.

- 3 (a) Define : Geometric mean, median and mode. 3

OR

- (a) Define : 3
 (i) Standard deviation
 (ii) Mean Deviation
 (iii) Range.
- (b) Find Quartile Deviation and Mean deviation about mean 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 median, mode, D_4 and P_{20} 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) Show that $A.M > G.M > H.M.$ 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

OR

- (c) The runs of two cricketers in 10 matches are as follows. Decide which cricketer is more reliable ? 5

Runs	Cricketer A	15	8	29	36	51	104	2	18	21	6
	Cricketer B	39	26	43	50	48	73	118	20	53	10

- 4 (a) Define : 3
 (i) Sample space
 (ii) Mutually exclusive events
 (iii) Independent events.

OR

- (a) (i) State addition theorem on probability. 3
(ii) Mathematical expectation
(iii) Axioms of probability.
- (b) Attempt any two : 8
(i) If $P(A/B) = 0.07$, $P(A) = 0.25$, $P(B) = 0.5$ then find
 $P(B/A)$, $P(\bar{A}/B)$, $P(\bar{A} \cup \bar{B})$
(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, (i) 1 girl (ii) 1 boy (iii) at least one boy.
(iii) Three bags have the following nos. of balls. One bag is selected at random and 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-II ?

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

- 5 (a) State the probability function of B.D. and obtain its variance. 3

OR

- (a) State the probability function of Poisson distribution and obtain its mean. 3
(b) Attempt any two : 8
(i) The p.m.f. of a r.v. x is

x	0	1	2	3
$P(x)$	k	0.3	0.2	0.4

Find :

- (i) Constant K
(ii) $V(x)$
(ii) For B.D. with $n = 6$, $3 P(x=2) = 2p(x=3)$ then find $P(x=0)$ and $P(x>3)$
(iii) For P.D. if $P(x=0) = P(x=1)$ then find $P(x=2)$ and $P(x>3)$.