

[6] Seat No. _____

No. of printed pages : 4

SARDAR PATEL UNIVERSITY
M.Sc. (Integrated) (IT) (Second Semester) (NC) Examination
Monday, 17th October 2016
2.00 pm – 4.00 pm
PS02FIIT02 : Mathematics-II

Maximum Marks: 70

Q-1 Write the correct option in the answer book.

[10]

(1) Let $A = \{0, 1\}$, then A closed under:

- (a) multiplication (b) addition (c) Division (d) Subtraction

(2) Quartile deviation is defined as

- (a) $\frac{Q_3 - Q_1}{2}$ (b) $\frac{Q_3 - Q_1}{3}$ (c) $\frac{Q_1 - Q_2}{2}$ (d) $\frac{Q_3 + Q_1}{2}$

(3) We can select three objects from the given 10 objects in..... ways.

- (a) $\binom{3}{10}$ (b) $\binom{10}{3}$ (c) $\frac{10!}{3!}$ (d) $\frac{9!}{3!}$

(4) $P(8, 4) =$

- (a) 1480 (b) 1680 (c) 168 (d) 1860

(5) The set $\{x \in \mathbb{Q} : 2 < x < 9\}$ is:

- (a) finite (b) Infinite (c) Empty (d) none

(6) Every monoid are:

- (a) group (b) ring (c) semigroup (d) none

(7) The relation between correlation coefficient and regression coefficients is

- (a) $r = \pm \sqrt{b_{XY} b_{YX}}$ (b) $r = \frac{b_{XY} + b_{YX}}{2}$
(c) $r = \pm \sqrt{b_{XY} b_{YX}}$ (d) None of these

(8) The set $\{\mathbb{N}, +\}$ is:

- (a) group (b) ring (c) monoid (d) semigroup

(9) The number of elements in a set $\{x \in \mathbb{R} : x^2 - 2 = 0\}$ are:

- (a) 1 (b) 2 (c) $\pm\sqrt{2}$ (d) 0

(PTO)

(10) De Morgan's Law:

(a) $(A \cup B)^c = A^c \cap B^c$

(b) $(A \cap B)^c = (A \cup B)^c$

(c) $(A \cup B)^c = A \cap B^c$

(d) None

Q:2 Answer the following in short. (Any Ten)

[20]

- (1) If S is a nonempty set with the operation $a*b = a$. Is the operation* associative?
- (2) Define range and variance.
- (3) Explain the positive correlation with two examples.
- (4) How many committees of six with a given chair person can be selected from twelve persons?
- (5) Find the power set of a set {a, b, c}.
- (6) Define the terms: Group, Monoid.
- (7) If $A = \{1,2,3,\dots,12\}$ and $B = \{4,6,7,\dots,16\}$ then find the symmetrical difference between A and B.
- (8) Find dual of the following:
(i) $(A \cap B \cup C)^c = (A \cap C)^c \cap (A \cap B)^c$, (ii) $(A \cap \phi) \cup (U \cap A^c) = A$.
- (9) Find the number of ways that a party of seven persons can arrange themselves around a circular table.
- (11) Find variance of the following observations:
7, 7, 7, 7, 7, 7, 7, 7.
- (12) Find the number of distinct permutation that can be formed from all the letters of the word (1) MATHEMATICS (2) UNMARRIED

Q-3

(a) Prove that $1+2+3+\dots+n = \frac{n(n+1)}{2}$. [05]

(b) By using algebra of sets , prove that $(\phi \cup A) \cap (B \cup A) = A$. [05]

Q-3

OR

- (c) Define a function F as $F(a, b) = 0$ if $a < b$. [05]
 $= F(a - b, b) + 1$ if $b \leq a$.

Find $F(4, 3)$ and $F(14, 3)$.

- (d) If $f(x) = x^2 + 5x$ and $g(x) = 3x + 2$ then find : (i) $f \circ g$ (ii) $f \circ g(1)$ (iii) $g \circ f(0)$. [05]

Q-4

- (a) For a, b rational number set Q , define $a * b = ab/3$. Show that [05]
 $(Q, *)$ is a group under binary operation $*$.

- (b) For $a, b \in Q$ (rational numbers), define $a * b = a + b - ab$. [05]

(i) Is $(Q, *)$ Semigroup?

(ii) Is $(Q, *)$ Monoid ?

(iii) Find its inverse if it exist.

Q-4

OR

- (c) Show that the set $\{1, 2, 3, 4, 5, 6\}$ is a group under multiplication modulo 7. [05]

- (d) For a, b rational number, define $a * b = ab/4$. Is $(Q, *)$ commutative? Show that [05]
 $(Q, *)$ is Monoid and find its inverse if it exist.

Q-5

- (a) Find the number of ways that four mathematics books, three history books, three [05]
chemistry books and two sociology books can be arranged on a shelf so that all
books of the same subject are together.

- (b) A bag contains five red marbles and six white marbles. Find the number m of [05]
ways that four marbles can be drawn from the bag such that two of the marbles
must be red and two of the marbles must be white.

Q-5

OR

- (c) A debating team consists of 3 boys and 3 girls. Find the number of ways they [05]
can sit in a row where: (a) there are no restrictions; (b) the boys and girls are
each to sit together; (c) just the girls are to sit together.

- (d) Find n if : (1) $2P(n, 2) + 50 = P(2n, 2)$ (2) $P(n, 4) = 840$ [05]

(PTO)

- Q.6 Calculate the Standard Deviation the following table giving the age distribution of 542 members. [06]
 (a)

Age in year	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Members	3	61	132	153	140	51	2

- (b) Given $\sum X = 125$, $\sum Y = 100$, $\sum X^2 = 650$, $\sum Y^2 = 436$, $\sum XY = 520$ and $n = 25$ Obtain the value of Karl Pearson's coefficient of correlation r . [04]

OR

- Q.6 Calculate Karl Pearson's coefficient of correlation between x and y from the following data: [06]
 (a)

X	10	6	9	10	12	13	11	9
Y	9	4	6	9	11	13	8	4

- (b) Write differences between correlation and regression. [04]

$$\bar{X} = \bar{X} = \bar{X}$$