SARDAR PATEL UNIVERSITY
B. C. A. (I Semester) Examination
4th April 2016 (Monday)
2.30 pm – 4.30 pm
US01FBCA02 : MATHEMATICS – 1

Total Marks : 70

Q–1 Select the correct option for each of the followings: 10

1 If A = {1, 2, 3, 4} and B = {2, 4, 6, 8} then A ∪ B = _____
(a) {1,2,3,4,6,8} (b) {1,3} (c) {2,4} (d) None

2 If A = {a, b, c, d} and B = {b, c, d, e} then A ⊕ B = _____
(a) {b, c, d} (b) {a, e} (c) {a, b, c, d, e} (d)None

3 A ∪ U = _____.
(a) A (b) Ø (c) U (d) None

4 a * e = _____.
(a) e (b) ea (c) a (d) None

5 $a * a^{-1}$ = _____.
(a) 1/a (b) e (c) a (d) None

6 A semigroup with an identity element is called _____.
(a) monoid (b) ring (c) group (d) None

7 If u = (4, 7, 9) and v= (2, 4, −5) then u + v = _____.
(a) (6,11,4) (b) (6,11, −4) (c) (8,28, −45) (d) None

8 If u = (−3, 12, −4) then ||u|| = _____.
(a) 12 (b) 13 (c) −13 (d) None

9 The observation whose frequency is highest is called_____.
(a) mean (b) median (c) mode (d) None

10 _____ is the value dividing the data into two equal parts.
(a) Mode (b) Mean (c) Median (d) None

Q–2 Do as directed : (Attempt Any 10) 20

1 Find the power set of A = {1, 2, 3, 4}.

2 prove with the help of laws : (Ø ∪ A) ∩ (B∪A) = A

3 Calculate 4! = using the recursive definition.

4 Define left and right cancellation laws for an operation * on a set S.

5 Let A = {1, 2}. (i) Is A closed under Addition? (ii) Is A closed under Multiplication?

6 Suppose e is a left identity and f is a right identity for an operation. Show that e=f.

7 Let u = (2, 3, −4) and v = (1, −5, 8) then find 2u − 3v.

8 Find x and y if x(1, 1) + y(2, −1) = (1, 4).

9 Find the determinant of (i) $\begin{pmatrix} 2 & 1 \\ -4 & 6 \end{pmatrix}$ (ii) $\begin{pmatrix} a-b & a \\ a & a+b \end{pmatrix}$

10 The intelligence quotients (IQ's) of 10 boys is given below:
90, 120, 110, 100, 58, 53, 95, 98, 107, 110
Find the Mean IQ.

11 Derive the formula for Geometric Mean.

12 Find the median for the following data.

x_i	0	1	2	3	4	5	6	7	8
f_i	1	9	26	59	72	52	29	7	1

Q−3 Do as directed: **(10)**

(a) Prove the following proposition: 5

$P(n) : 1^2 + 2^2 + \ldots\ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$

(b) Find a formula for the inverse of $h(x) = \frac{2x-3}{5x-7}$ 5

OR

Q−3 Do as directed: **(10)**

(a) Consider the function $f(x) = x^2$. Find the followings: 6
(i) value of f at 5, - 4 and 0.
(ii) $f(y + 2)$ and $f(x + h)$.
(iii) $[f(x + h) - f(x)] / h$.

(b) Let a and b denote positive integers. Suppose a function Q is defined recursively as follows: 4

$$Q(a, b) = \begin{cases} 0 & \text{if } a < b \\ Q(a - b, b) + 1 & \text{if } b \le a \end{cases}$$

(i) Find the value of Q (2, 3) and Q (14, 3)

(ii) What does this function do? Find Q (5861, 7).

Q–4 Do as directed: **(10)**

(a) Define ring. 3

(b) Consider the set N of positive integers and let * be the operation of least common multiple (l. c. m) on N. 3

(i) Find 4*6 and 3*5.

(ii) Is (N,*) a semigroup? Is it commutative?

(iii) Which elements have inverses and what are they?

(c) Consider the group G = {1, 2, 3, 4, 5, 6} under multiplication modulo 7. Find the multiplication table of G. And also find 2^{-1}, 3^{-1},4^{-1},5^{-1} 4

OR

Q–4 Do as directed: **(10)**

(a) Show that the left and right cancelation laws hold in G. 3

(b) Show that a(–b) = (–a)b= –ab in a ring R. 4

(c) Consider the set Q of rational numbers and let * be the operation on Q defined by a * b = a + b – ab. 3

(i) Find 3*4 and 2*(–5)

(ii) Is (Q,*) a semigroup? Is it commutative?

(iii) Find the identity element of *.

Q–5 Do as directed: **(10)**

(a) If u=(1, 2, 3, –4), v=(5, –6, 7, 8) and k=3 then find: 3

(i) k(u•v) (ii) (ku) • v (iii) u•(kv)

(b) Find A^TB^T where $A = \begin{pmatrix} 2 & 6 & 2 \\ 5 & -1 & 3 \\ 3 & 1 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{pmatrix}$ 3

(c) Solve by determinants : 4

$2x - 3y = 7$

$3x + 5y = 1$

OR

Q–5 Do as directed: **(10)**

(a) Find x, y, z, and t if $A = \begin{pmatrix} 5 & 2 & x \\ y & z & -3 \\ 4 & t & -7 \end{pmatrix}$ is symmetric. 4

(b) Determine the value of k such that $|| u || = \sqrt{39}$ where $u = (1, k, -2, 5)$ 3

(c) Find AB and BA where $A = \begin{pmatrix} 2 & 6 & 2 \\ 5 & -1 & 3 \\ 3 & 1 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{pmatrix}$ 3

Q–6 Prepare a frequency distribution of the number of letters in a word from the following paragraph (ignore punctuation marks): **(10)**

"In the beginning", said a Persian Poet, "Allah took a rose, a lily, a dove, a serpent, a little honey, a Dead Sea Apple and a handful of clay. When he looked at the amalgam – it was a woman."

Also obtain:

(i) the number of words with letters 6 or more

(ii) the proportion of words with 5 letters or less

(iii) percentage of words with number of letters between 2 and 6

(iv) the proportion of words with 6 letters or more

OR

Q–6 Find mean, median, mode, Geometric Mean and Harmonic Mean for the following data. **(10)**

x_i	130	135	140	145	146	148	149	150	157
f_i	3	4	6	6	3	5	2	1	1

ALL THE BEST