

**FYJC Annual Exam February 2023-Maths**

Maths

Time : 3 Hrs

Marks: 80

**General Instructions:**

- 1) All questions are compulsory.
- 2) There are 6 questions divided in two sections.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithm table is allowed. Use of Calculator is not allowed.
- 5) For LPP problem graph paper is not necessary, only sketch of graph is expected.

**Section I**

**Q.1.A) Select and write the most appropriate answer from the given alternatives for each sub-questions:**

(06)

- i) If  $n(A) = p$   $n(B) = q$  then  $n(A \times B) =$  \_\_\_\_\_  
(a)  $p(q)$                       (b)  $p + q$                       (c)  $p - q$  (d)  $p/q$
- (ii) If  $f(x) = x^2 - 3x + 1$  then  $f(0) =$  \_\_\_\_\_  
(a) 3                      (b) 9                      (c) -3                      (d) 1
- (iii) The Real part of  $z = 3i$  (where  $i = \sqrt{-1}$ ) is \_\_\_\_\_  
(a) 0                      (b) 3                      (c) 1                      (d) -1
- (iv) If any two rows of a determinant is equal, the value of the determinant is \_\_\_\_\_  
(a) 0                      (b) 1                      (c) -1                      (d) 5
- (v) If  $y = 2x$  then  $\frac{dy}{dx} =$  \_\_\_\_\_  
(a) 2                      (b) 0                      (c) 1                      (d) -2
- (vi) If  $y = 2$  then  $\frac{dy}{dx} =$  \_\_\_\_\_  
(a) 1                      (b) 2                      (c) 0                      (d) 5

Contd Pg-2/

Q.1.B) State whether the following statements are true or false: (03)

- (1) The order pair (0,5) belongs to the relation  $R = \{ (x,y) \mid x^2 + y^2 = 25 \text{ where } x,y, \in W \}$
- (2) If A and B are disjoint sets  $n(A \cap B) = 2$
- (3) If  $y = \frac{1}{\sqrt{x}}$  then  $\frac{dy}{dx} = \frac{1}{2\sqrt{x}}$

Q.1.C) Fill in the blanks with appropriate words or numbers: (03)

- (i) If f is a function from A to B then A is the \_\_\_\_\_ of the function f
- (ii) The value of  $1 - i + i^9$  is \_\_\_\_\_ where  $i = \sqrt{-1}$
- (iii) The slope of the line passing through the points A(2, -1) and B (4,3) is \_\_\_\_\_

Q.2.A) Attempt any two of the following : (06)

- (i) Express  $R = \{ (a, a^2) \mid a \text{ is a prime number less than } 14 \}$  as a set of order pairs what is the domain and range of R.
- (ii) If A and B are subsets of the universal set X  $n(X) = 50$   $n(A) = 35$   $n(B) = 20$   $n(A \cap B) = 10$   
find (a)  $n(A \cup B)$  (b)  $n(A \cap B')$  (c)  $n(A' \cap B')$
- (iii) Find the slope, x intercept and y intercept of the line  
 $2x + 3y = 12$

Q.2.B) Attempt any two of the following: (08)

- (i) Find the value of x and y satisfying the equation  $(x + 2y) + (2x - 3y)i + 4i = 5$  where  $i = \sqrt{-1}$   
 $x, y \in R$
- (ii) There are 260 persons with skin disorder. If 150 has been exposed to chemical A, 74 to Chemical B and 36 to both Chemical A and Chemical B. Find the number of persons exposed to (a) Chemical A or Chemical B (b) Neither Chemical A nor Chemical B (c) Chemical B but not Chemical A
- (iii) Find the equation of the line whose x intercept is 3 and which is perpendicular to the line  $3x - y + 23 = 0$

Q.3.A) Attempt any two of the following (06)

- (i) If  $f(x) = 4x - 2$  when  $x \leq -3$   
 $= 5$  when  $-3 < x < 3$   
 $= x^2$  when  $x \geq 3$   
Find (a)  $f(-3)$  (b)  $f(2)$  (c)  $f(3)$

Contd on Pg-3/

(ii) Without expanding find the value of the determinant

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$$

(iii) Differentiate  $x^3 \log x$  w.r.t  $x$

Q.3.B) Attempt any one of the following :

(04)

(i) Solve the equation using Cramers Rule

$$x + 2y - z = 5, \quad 2x - y + z = 1, \quad 3x + 3y = 8$$

(ii) If  $y = \frac{x^2 + a^2}{x^2 - a^2}$  find  $\frac{dy}{dx}$

Q.3.C) Attempt any one of the following (activity):

(04)

(i) The demand  $D$  for a price  $P$  is given as  $D = \frac{27}{p}$  find the Marginal demand when price is 3

$$D = \frac{27}{p}$$

Marginal Demand =

$$= 27 \frac{d}{dp} \left[ \frac{1}{p} \right] = \text{}$$

Marginal demand when  $p=3 = \text{}$

(ii) The total cost  $c = 5x^3 + 2x^2 + 7$  Find the average cost when  $x = 4$

$$\text{Average Cost} = \frac{c}{x}$$

$$\text{Average Cost} = \frac{\text{}}{\text{}}$$

Average cost when  $x = 4$

$$= \frac{(5) \text{} + 2(4)^2 + 7}{4}$$

$$\therefore \text{Average Cost} = \text{}$$

## SECTION II

Q.4.A) Select and write the most appropriate answer from the given alternatives for each sub question. (06)

(i)  $Q_1$  is equivalent to the partition value.

- (a)  $P_{25}$       (2)  $D_{20}$       (3)  $P_{75}$       (4)  $D_5$

(ii) If the  $\text{Var}(x) = 9$  S.D.(x) is -----

- (a) 3      (b) 4      (c) 9      (d) -3

(iii) If the S.D (x) = 4      If  $u = x - 3$       S.D(u) = \_\_\_\_\_

- (a) 4      (b) 5      (c) 12      (d) 1

(iv) If  $r = 1$  correlation between x and y is

- (a) Perfect positive      (b) zero      (c) Negative      (d) perfect negative

(v)  $\text{cov}(x,x)$  is equal to

- (a) r      (b)  $\text{var}(x)$       (c) S.D (x)      (d) coefficient of variation

(vi) If the length of a rectangle is decreased by 20% What should be increase in the breadth of the Rectangle so that area remains the same.

- (a) 25%      (b) 20%      (c) 35%      (d) 30%

Q.4.B) State whether the following statements are True or False: (03)

(i) The ogive is used to determine partition values.

(ii) Coefficient of variation is a relative measure of dispersion

(iii) The solution set of  $|x| \leq 3$  is  $-3 \leq x \leq 3$

Q.4.C) Fill in the blanks with appropriate words/numbers: (03)

(i) If  $r(x,y) = 0.8$        $u = 2(x-5)$        $v = \frac{y-5}{6}$        $r(u,v)$  is \_\_\_\_\_

(ii) If  $Q_1 = 5$        $Q_3 = 16$        $Q.D =$  \_\_\_\_\_

(iii) The value of  $5P_0 =$  \_\_\_\_\_

Q.5.A) Attempt any two of the following:

(06)

(i) If  $\Sigma x = 108$     $\Sigma x^2 = 792$     $n = 18$    find variance and S.D

(ii) Calculate correlation coefficient if  $n = 5$     $\Sigma x = 30$     $\Sigma y = 40$     $\Sigma x^2 = 220$

$\Sigma xy = 214$     $\Sigma y^2 = 340$    (given  $\sqrt{2} = 1.41$ )

(iii) How many three digit number can be formed from the digits 0,1,3,5,6 if

- (a) Repetition of digits is not allowed
- (b) Repetition of digits is allowed

Q.5.B) Attempt any two of the following :

(08)

(i) If  $x$  is the daily expenditure of families (in Rs.) Compute the expenditure below which 75% of families have their expenditure.

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| $x$ | 350 | 450 | 550 | 650 | 750 |
| $f$ | 16  | 19  | 24  | 28  | 13  |

(ii) For a certain bivariate data the information is given

|      |     |     |
|------|-----|-----|
|      | $X$ | $Y$ |
| Mean | 13  | 17  |
| S.D  | 3   | 2   |
| Size | 10  | 10  |

Obtain the combined S.D

(iii) Find the number of observations if  $r = 0.15$     $S.D(y) = 4$     $\Sigma(x - \bar{x})(y - \bar{y}) = 12$   
 $\Sigma(x - \bar{x})^2 = 40$

Q.6.A) Attempt any two:

(06)

- (i) A fair dice is thrown two times. Find the chance both the time dice shows same number (doublet)
- (ii) Solve the inequation  $|2x + 7| \leq 25$
- (iii) Find the compound interest on Rs.10,000/- for 2 yrs at 8% compounded half yearly (given  $(1.04)^4 = 1.1699$ )

Q.6.B) Attempt anyone of the following:

(04)

(i) For a word ALGORITHM

(a) Find the number of arrangement of letters of the word ALGORITHM.

(b) Find the number of arrangement of letters of the word ALGORITHM such that the vowels are Together

(ii) Mr.Rajesh has Rs.1,800 to spend on fruits for meeting. Grapes cost Rs.150 per kg and peaches cost Rs.200 per kg. Formulate and solve it graphically.

Q.6.C) Attempt anyone of the following (activity)

(04)

(i) A room has three socket for lamps. From a collection of 10 light bulbs of which 6 are defective. A person selects 3 bulbs at random and puts them in socket. What is the probability that the room is lighted?

$$n(s) = {}^{10}C_3 = \boxed{\phantom{000}}$$

Let A be the event that there is a light from atleast one bulb i.e(the room is lighted). Then A' is the event that room is not lighted

$$n(A') = {}^6C_3 = \boxed{\phantom{000}}$$

$$P(A') = \frac{n(A')}{n(s)} = \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}} = \frac{1}{6}$$

$$P(A) = 1 - \boxed{\phantom{000}} = 1 - \frac{1}{6} = \frac{5}{6}$$

(ii) Chitra furnishing purchased curtain cloth for Rs.28,00,000/- and sold for Rs.44,80,000/- Rate of G.S.T is 5%

$$\begin{aligned} \text{Soln: Input tax} &= \left(\frac{5}{100}\right) 28,00,000 \\ &= 1,40,000 \end{aligned}$$

$$\text{ITC} = \boxed{\phantom{000}}$$

$$\text{Output Tax} = \boxed{\phantom{000}}$$

$$\text{GST payable} = \text{output tax} - \text{ITC}$$

$$= \boxed{\phantom{000}}$$

$$\text{CGST} = \text{SGST} = \boxed{\phantom{000}}$$

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