**Q.1 A)** **Select and write the most appropriate answers from the given alternative for each sub question.-**                                    6

i) The value of the determinant $\begin{vmatrix} 4 & 7 \\ -7 & 0 \end{vmatrix}$ is equal to _____

   a) -4        b) 0         c) 49          d) 4

ii) Conjugate of $1 + i$ is _____

   a) i      b) 1       c) $1 - i$      d) $1 + i$

iii) Derivative of $x^6 + 6^x$ with respect to x is _____

   a) 12x      b) x + 4      c) $6x^5 + 6^x \log 6$       d) $6x^5 + x6^{x-1}$

iv) If A, B and C are any three sets, then A x (B U C) is equal to _____

   a) (A x B ) U ( A x C )       b) (A U B) x (A U C)    c) ( A x B ) ∩ (A x C)    d) None of these

v) If $f(x) = x^2 - 6x + 9$ then f(3) = _____

   a) 4        b) 1        c) 0       d) 8

vi) A function f is continuous at a point x = a in the domain of f if _____

   a) a) $\lim_{x \to a} f(x)$ exists

   b) $\lim_{x \to a} f(x) = f(a)$

   c) $\lim_{x \to a} f(x) \neq f(a)$

   d) both a & b

**B)** **State whether following statements are True or False :**                                    3

i) If a set A has n elements then the total number of subset of A is $2^n$.

ii) The lines $x - 2y - 7 = 0$ & $2x - 4y + 5 = 0$ are parallel to each other.

iii) If $y = \dfrac{u}{v}$ where u , v & y are function of x then $\dfrac{dy}{dx} = \dfrac{u\dfrac{du}{dx} - v\dfrac{dv}{dx}}{v^2}$

**C)** **Fill in the blanks**                                    3

i) If $i = \sqrt{-1}$ then $i^{888}$ is equal to _____.

ii) The total cost function is given by $C = 2x^2 + 5x + 200$. Then average cost function is _____.

iii) The set R of real numbers is a subset of the set of _____ numbers

**Q.2 A)** **Attempt any Two of the following :**                                    6

i) Evaluate
   $$\lim_{x \to 0} \frac{5^x + 3^x - 2^x - 1}{x}$$

ii) A(-5 , 2 ) and B(4 , 1 ). Find the equation of locus of point P, which is equidistant from A and B.

iii) Find k, if the equations $x + 3y + 2 = 0$   & $2x + 4y - k = 0$
   Are consistent

**B) Attempt any Two of the following :** 8

i) In a hostel, 25 students take tea, 20 students take coffee, 15 students take milk, 10 students take both tea and coffee, 8 students take both milk and coffee. None of them take tea and milk both and everyone takes atleast one beverage , find the number of students in the hostel.

ii) If $f(x) = 3x + 5$, $g(x) = 6x - 1$ then find

    a) $(f + g)(x)$       b) $(f.g)(3)$

iii) Without using Pythogoras theorem, show that points A(4,4), B(3,5) and C (-1,-1) are the vertices of a right-angled triangle.

**Q.3 A) Attempt any Two of the following :** 6

i) Solve the quadratic equation $8x^2 + 2x + 1 = 0$

ii) If $y = e^x \log x$. Find $\dfrac{dy}{dx}$

iii) If for a commodity, the price – demand relation is given as $D = \dfrac{P+5}{P-1}$

    Find the marginal demand when price is 2.

**B) Attempt any one of the following :** 4

i) Test the continuity of the following function at the points indicated against it.

$$f(x) = \frac{x^3 - 27}{x^2 - 9} \quad \text{for } 0 \le x < 3$$

$$= \frac{9}{2}, \quad \text{for } 3 \le x \le 6, \text{ at } x = 3$$

ii) Evaluate

$$\lim_{x \to 0} \frac{\sqrt{6 + x + x^2} - \sqrt{6}}{x}$$

**C) Attempt any one of the following activity:** 4

i) Fill in the blanks in the steps of solution of the following problem and complete it.

The cost of 4 kg potato, 3 kg wheat and 2 kg rice is Rs.150. The cost of 1 kg potato, 2 kg wheat and 3 kg rice is Rs.125. The cost of 6 kg potato, 2 kg wheat and 3 kg rice is Rs.175. Find the cost of each item per kg by using Cramer's Rule.

Let x , y , z be the costs of potato, wheat and rice per kg respectively. The given information can be written in equation form as

$4x + 3y + 2z = \boxed{\phantom{0}}$

$x + \boxed{\phantom{0}}\, y + 3z = 125$

    $x + 2y + 3z = 175$

$$D = \begin{vmatrix} 4 & 3 & 2 \\ 1 & \boxed{\phantom{0}} & 3 \\ 6 & 2 & 3 \end{vmatrix} = 25, \qquad D_x = \begin{vmatrix} \boxed{\phantom{0}} & 3 & 2 \\ 125 & 2 & 3 \\ 175 & 2 & 3 \end{vmatrix} = 250$$

$$D_y = \begin{vmatrix} 4 & 150 & 2 \\ 1 & 125 & 3 \\ 6 & 175 & 3 \end{vmatrix} = \boxed{\phantom{0}}$$

$$D_z = \begin{vmatrix} 4 & 3 & 150 \\ 1 & \boxed{\phantom{0}} & 125 \\ 6 & 2 & 175 \end{vmatrix} = 625$$

$x = \boxed{\phantom{0}}$ , $y = \boxed{\phantom{0}}$ , $z = \boxed{\phantom{0}}$

ii) The supply S for a commodity at price P is given by $S = P^2 + 9P - 2$. Find the marginal supply when price is 7. Interpret the result

$S = P^2 + 9P - 2$

Marginal supply $= \dfrac{dS}{dP} = \boxed{\phantom{xx}} = \boxed{\phantom{xx}}$

When P = 7

Marginal supply $= \left(\dfrac{dS}{dP}\right)_{P=7} = \boxed{\phantom{xx}}$

Interpretation : _____

## SECTION - II

Q.4 A) Select and write the most appropriate answers from the given alternatives:  7

i) Which of the following is not partition value

   a) Quartile    b) Percentile      c) Mean      d) Median

ii) Which of the following measures of dispersion considers middle 50% of the observation?

   a) Range    b) standard deviation    c) Quartile deviation    d) None of these

iii) What is the range of correlation coefficient ?

   a) $\emptyset$      b) {-1 , 1}      c) [0 , 1]    d) [-1 , 1]

iv) The common region represented by $0 \le x \le 8$ , $0 \le y \le 8$ is _____.

   a) triangle    b) square    c) rectangle    d) pentagon

v) If two variables x & y , the cov(X ,Y ) is 40, $\sigma_x^2 = 16$ and $\sigma_y^2 = 256$ .Then correlation coefficient is _____.

   a)0.01    b) 0.625    c) 0.4      d) 0.5

vi) $\chi^2$ - statistic is given by _____

   a) $\sum \left(\dfrac{O-E}{E}\right)^2$    b) $\sum \dfrac{(O-E)^2}{E}$    c) $\sum \left[\dfrac{(O-E)}{E^2}\right]$    d) $\sum \dfrac{(O-E)}{E}$

**B) State whether the following statements are True or False :**  **3**

i) 1st Percentile is greater than 1st Decile

ii) The value of standard deviation is always positive

iii) $^nP_r = \dfrac{n!}{(n-r)!}$

**C) Fill in the blanks with appropriate words.**

i) 4 buses runs between Bhopal and Gwalior. If a man goes from Gwalior to Bhopal by a bus and comes back to Gwalior by another bus, then the total possible ways are _____

ii) If there is perfect positive correlation between two variables, then correlation coefficient r = _____.

iii) Simple interest on an amount of Rs.9600 at the rate of 6% per annum after 3 years is _____.

**Q.5 A) Attempt Any Two :**      **6**

i) The following is the frequency distribution of heights of 200 male adults in a factory

| Height in cm | No. of male adults |
|---|---|
| 145 – 150 | 4 |
| 150 – 155 | 6 |
| 155 – 160 | 25 |
| 160 – 165 | 57 |
| 165 – 170 | 64 |
| 170 – 175 | 30 |
| 175 – 180 | 8 |
| 180 – 185 | 6 |

Find the central height.

ii) A group of 65 students of class XI have their average height is 150.4 cm with coefficient of variation 2.5%. What is the standard deviation of their height?

iii) Determine the number of arrangements of letters of the word ALGORITHM if

a) Vowels are always together

b) O is the first and T is the last letter.

**B) Attempt Any Two :**      8

i) Find graphical solution of the following system of linear in equations

$3x + 2y \leq 24$

$3x + y \geq 15$

$x \geq 14$

ii) In an examination, 30% of the students have failed in subject I, 20% of the students have failed in subject II and 10% have failed in both subject I and subject II. A student is selected at random, what is the probability that the student
i) has failed in subject I, if it is known that he is failed in subject II?
ii) has failed in at least one subject?

iii) Heena Enterprise sold cosmetics worth Rs.25000 to Leena traders, a retailer. Leena Trader sold it further to Meena Beauty products for Rs.30000. Meena beauty product sold it further to the customers for Rs.40000. Rate of GST is 18%.
Find    a) GST payable by each party

**Q.6 A) Attempt Any Two :**      **6**

i) Find 77% of 580 + 34 % of 390.

ii) Mr.Rajesh has Rs.1800/- to spend on fruits for a meeting. Grapes cost Rs.150/- per kg and peaches cost Rs.200/- per kg. Formulate and solve it. graphically .

iii) A batsman scored 92 runs which includes 4 boundaries 5 sixes. He scored other runs buy running between the wickets. What percent of his total score did he make by running between the wicket?

**B) Attempt Any One :**      8

i) Two cards are drawn from a pack of 52 cards. Find probability that

a) Both are black     b) Both are ace cards

ii) Find r if $^{11}C_4 + {}^{11}C_5 + {}^{12}C_6 + {}^{12}C_6 + {}^{13}C_7 = {}^{14}C_r$

**C)** **Attempt Any One of the following activity :** 4

i) A sample of boys and girls were asked to choose one colour from three options – pink , blue and orange to paint their room, calculate $x^2$ statistic.

|        | Pink | Blue | Orange | Total |
|--------|------|------|--------|-------|
| Boys   | 27   | 63   | 10     | ---   |
| Girls  | 41   | 45   | 14     | ---   |
| Total  | ---  | ---  | ---    | ---   |

Expected frequencies

$$E_{11} = \frac{100 \times 68}{200} = \square \qquad , E_{12} = \frac{100 \times \square}{\square} = 54$$

$$E_{13} = \frac{\square \times \square}{200} = 12 \quad , E_{21} = \frac{100 \times 68}{200} = \square$$

$$E_{22} = \frac{\square \times \square}{200} = \square \quad , E_{23} = \frac{\square \times \square}{200} = \square$$

$$x^2 = \Sigma \left[ \frac{(Oij - Eij)^2}{Eij} \right]$$

$$= \frac{(27-34)^2}{34} + \square + \square + \frac{(41-34)^2}{34} + \square + \square$$

$$= \boxed{\phantom{xxxxxxxxxx}}$$

ii) Find correlation coefficient from following data: [Given : $\sqrt{3}$ = 1.732]

| x | y | $x^2$ | $y^2$ | xy |
|---|---|-------|-------|----|
| 3 | 4 |       |       |    |
| 6 | 5 |       |       |    |
| 2 | 8 |       |       |    |
| 9 | 6 |       |       |    |
| 5 | 7 |       |       |    |
| Total | | | | |

$n = $ _____  $\qquad \Sigma xy = $ _____

$\Sigma x = $ _____  $\qquad \Sigma y = $ _____

$\Sigma x^2 = $ _____  $\qquad \Sigma y^2 = $ _____

$\bar{x} = $ _____  $\qquad \bar{y} = $ _____

∴ Karl Pearson's coefficient of correlation

$$= \frac{\frac{1}{n}\Sigma xy - \bar{x}\,\bar{y}}{\sqrt{\frac{1}{n}\Sigma x^2 - \bar{X}^2}\ \sqrt{\frac{1}{n}\Sigma y^2 - \bar{Y}^2}}$$

$= $ _____

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