Time : 3.00 Hours
Maximum Marks : 80

MATHEMATICS
ISC
Sample Question Papers

Self Assessment Paper 1

GENERAL INSTRUCTIONS :

(i) *The Question Paper consists of three sections A, B and C.*

(ii) *Candidates are required to attempt all questions from* ***Section A*** *and all questions* ***EITHER*** *from* ***Section B OR Section C****.*

(iii) ***Section A :*** *Internal choice has been provided in two questions of two marks each, two questions of four marks each and two questions of six marks each.*

(iv) ***Section B :*** *Internal choice has been provided in one question of two marks each and one question of four marks.*

(v) ***Section C :*** *Internal choice has been provided in one question of two marks each and one question of four marks.*

(vii) *All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer.*

(viii) *The intended marks for questions or parts of questions are given in brackets [ ].*

(ix) *Mathematical tables and graph papers are provided.*

SECTION A (65 MARKS)

Question 1 **[15 × 1]**

In sub-parts (i) to (x) choose the correct option and in sub-parts (xi) to (xv), answer the questions as instructed.

(i) Domain of the function $\left[\left(x, \frac{x^2-9}{x-3}\right) : x \in R,\ x \neq 3\right]$ is

(a) $f(x) = \mathrm{R} + \{3\}$ **(b)** $f(x) = \mathrm{R} - \{3\}$

(c) $f(x) = \{3\} - \mathrm{R}$ **(d)** $f(x) = \{3\} + \mathrm{R}$

AI **(ii)** The value of cos 225° is

(a) $\sqrt{2}$ **(b)** $-\sqrt{2}$

(c) $\frac{1}{\sqrt{2}}$ **(d)** $-\frac{1}{\sqrt{2}}$

(iii) The value of $\tan(\pi + x) \tan(\pi - x) \cot^2 x$ is

(a) 0 **(b)** 1

(c) –1 **(d)** Not defined

(iv) The conjugate of $\frac{1}{5-7i}$ is

(a) $\frac{5}{74}-\frac{7}{74}i$ **(b)** $\frac{5}{74}+\frac{7}{74}i$

(c) $\frac{7}{74}-\frac{5}{74}i$ **(d)** $\frac{7}{74}+\frac{5}{74}i$

(v) If α and β are the roots of the quadratic equation $ax^2 + bx + 1$, then the value of $2\alpha^2\beta^2$ is

(a) $\frac{1}{a^2}$ **(b)** $\frac{1}{b^2}$

(c) $\frac{2}{a^2}$ **(d)** $\frac{2}{b^2}$

(vi) The number of terms in the expansion of $(1 - 10x + 25x^2)^{20}$ is

(a) 40 **(b)** 41

(c) 42 **(d)** 43

(vii) The values of x for which the numbers $\frac{4}{5}$, x, $\frac{5}{4}$ are in G.P. is

(a) 0 **(b)** –1

(c) +1 **(d)** ± 1

(viii) If the origin is shifted to (5, – 5), then the new co-ordinates of (4, 6) will be

(a) (–1, 11) **(b)** (11, –1)

(c) (–1, –1) **(d)** (–11, –11)

(ix) The equation of the circle with centre (0, 7) and radius 7 is

(a) $x^2 + y^2 + 14 = 0$ **(b)** $x^2 + y^2 - 14 = 0$

(c) $x^2 + y^2 + 14y = 0$ **(d)** $x^2 + y^2 - 14y = 0$

(x) $\lim_{x\to 0}\frac{\sin 5x}{x}$ is equal to

(a) 5^2 **(b)** $\frac{1}{5^2}$

(c) 5 **(d)** 1/5

(xi) Find the number of ways in which 5 boys and 3 girls can be seated in a row so that no two girls are together.

(xii) Find the derivative of $9x^2+\frac{3}{x}+5\sin x$ with respect to x.

(xiii) In a single throw of two dice, determine the probability of not getting the same number on both the dice.

(xiv) Find the angle between the x-axis and the line joining the points (3, –1) and (4, –2).

(xv) Find the middle term(s) in the expansion of $\left(x^2-\frac{1}{x}\right)^6$.

Question 2 **[2]**

For any set A and B, show that (A – B) = (A $\subset$ B')

Question 3 **[2]**

Let A = {1, 2, 3, 4, 5} and B = {1, 4, 5}

Let R be a relation is less than from A to B.

(a) List the element of R.

(b) Find the domain, co-domain and range of R;

Question 4 **[2]**

Find the general value of x for which $\sqrt{3}$ cosec $x = 2$.

Question 5 **[2]**

Prove that $\sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \, . \sin 4x$

OR

Solve : $4 \sin x . \cos x + 2 \sin x + 2 \cos x + 1 = 0$

Question 6 **[2]**

(a) Represent the complex number $-2i$ in the polar form.

OR

(b) If one root of $x^2 - x - k = 0$ is square of the other, then find the value of k.

Question 7 **[2]**

Draw the graph of the function

$$f(x) = \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{if } x = 0, \\ -1 & \text{if } x < 0 \end{cases} \quad x \in R$$

Question 8 **[6]**

If $f(x) = \dfrac{\cot x}{1 + \cot x}$ and $\alpha + \beta = \dfrac{5\pi}{4}$, then find $f(\alpha) . f(\beta)$.

OR

In any ΔABC, prove that

$a \cos A + b \cos B + c \cos C = 2a \sin B \sin C$.

Question 9 **[4]**

Prove by the principle of Mathematical Induction that $\log x^n = n \log x$, for all $n \in N$.

Question 10 **[4]**

(a) Find the derivative of $\sqrt{2x+3}$ using the first principle of differentiation.

OR

(b) Evaluate: $\lim\limits_{x \to 0} \dfrac{\sin 5x}{\tan 3x}$.

Question 11 **[6]**

If the coefficient of second, third and fourth terms in the expansion of $(1 + x)^{2n}$ are in A.P. then show that $2n^2 - 9n = -7$.

OR

Find a positive value of m for which the coefficient of x^2 in the expansion of $(1 + x)^m$, is 6. **[6]**

Question 12 **[6]**

The sum of three consecutive terms of an AP is 15 and their product is 105, find numbers.

Question 13 **[4]**

(a) Find the equation of a circle concentric with the circle $2x^2 + 2y^2 - 6x + 8y + 1 = 0$ and double of its area.

OR

(b) Find the equation of the lines through the point (3, 2) which make an angle of 45° with the line $x - 2y = 3$.

Question 14 **[6]**

Given below are the diameters of circles (in mm) drawn in a design.

Diameter	33 – 36	37 – 40	41 – 44	45 – 48	49 – 52
Number of Circles	15	17	21	22	25

Calculate the mean diameter of the circles, variance and standard deviation.

SECTION B (15 MARKS)

Question 15 **[5 × 1]**

In sub-parts (i) and (ii) choose the correct option and in sub-parts (iii) to (v), answer the questions as instructed.

AI **(i)** The eccentricity of the hyperbola $x^2 - y^2 = 9$ is

(a) $\sqrt{2}$ **(b)** $-\sqrt{2}$

(c) $\sqrt{3}$ **(d)** $-\sqrt{3}$

(ii) The distance of the point (4, 5, 6) from the XY plane is

(a) 2 unit **(b)** 4 units

(c) 6 units **(d)** 8 units

(iii) Find the equation of parabola whose focus is (6, 0) and directrix $x = -6$.

(iv) Find the equation of the ellipse whose focus is (1, – 2), the corresponding directrix $x - y + 1 = 0$ and eccentricity $\frac{2}{3}$.

(v) Write the negation of the statement "Product of 5 and 6 is 30" ?

Question 16 **[2]**

(a) Check the validity of the statement given below by contradiction method.

'Sum of a rational number and an irrational number is an irrational number.'

OR

(b) If it is known that Anita is rich, while Sunita is poor, assign truth values of following statement Anita is poor or Sunita is rich.

Question 17 **[4]**

If the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide. Then find the value of b^2.

OR

Find the length of the major axis, the eccentricity, the coordinates of the vertices and foci, and the length of latus rectum of the conic represented by the equation $4x^2 + y^2 = 100$.

Question 18 **[4]**

Find the equation of the curve formed by the set of all points the sum of whose distances from the points A(4, 0, 0) and B (– 4, 0, 0) is 10 units.

SECTION C (20 MARKS)

Question 19 **[5 × 1]**

In sub-parts (i) and (ii) choose the correct option and in sub-parts (iii) to (v), answer the questions as instructed.

(i) The wholesale price index (or price relative) of tomatoes in 2018 compared to 2016 is 150. If the cost of tomatoes was ₹ 15 per kg in 2016, calculate the cost in 2018.

(a) 16.50 **(b)** 16.00

(c) 24 **(d)** 15.00

AI **(ii)** Q2 is always equal to

(a) P10 **(b)** P25

(c) P50 **(d)** P75

(iii) Compute a price index for the following by simple aggregate method :

Commodity	A	B	C	D	E	F
Price in 1986(₹)	20	30	10	25	40	50
Price in 1991(₹)	25	30	15	35	45	55

(iv) Find the Q2 for the following distribution: 6, 7, 8, 3, 11, 19, 10, 15, 17, 13, 20, 5, 18

(v) Compute D_3 for the following distribution:

3, 13, 11, 11, 5, 4, 2

Question 20 **[6]**

(a) Out of total sample survey of 100 nuts, in a first sample survey of 35 items has mean 80 and standard deviation 4. A second sample survey of 65 items has mean 70 and standard deviation 3. Find the mean and variance of combined 100 sample nuts.

OR

(b) The following table gives information regarding weekly income of labourer working at a dam site.

Income in (₹)	200 – 300	300 – 400	400 – 500	500 – 600	600 – 700
No. of employees	150	160	130	180	120

Calculate the (i) median (ii) lower quartile (iii) upper quartile (iv) 5th decile.

Question 21 **[6]**

(a) While calculating correlation coefficient between two variables x and y for 30 pairs of observation, the students observed the following results:

$\Sigma x = 135$, $\Sigma x^2 = 680$, $\Sigma y = 110$, $\Sigma y^2 = 485$ and $\Sigma xy = 530$

On rechecking, it was found that he had wrongly copied one pair as (5, 8) whereas value is (7, 9) calculate the correct correlation coefficient between x and y.

OR

(b) Calculate spearman's rank correlation coefficient between the advertisement cost and sales cost of making a Maggie. The following data is given below.

Advertisement cost (₹ in thousands)	40	32	38	32	50	60	55
Sales (₹ in lakhs)	32	35	43	40	42	50	70

Question 22 **[4]**

Find the consumer price index for 2018 on the basis of 2015 from the following data using a weighted average price relative method.

Items	Price in 2015 (₹)	Price in 2018 (₹)	Weight
Food	200	280	20
Travel	150	180	10
Cloth	180	150	22
Rent	220	250	25
Ice-cream parlour	140	160	10
Fuel	250	300	30

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