

Class: 11th

Exam: Hr. Sec. Part I Max Marks: 100

Subject: Mathematics

Time: 3 Hours

Section (A) Long Answer Type Questions (5Q × 6M = 30Marks)

Q.No.1. Prove that; $\cos^2 x + \cos^2 \left(x + \frac{\pi}{3}\right) + \cos^2 \left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

Or

Find the general solution and the principle solution of:

$$\cos 3x + \cos x - \cos 2x = 0$$

Q.No.2. The coefficient of the $(r - 1)^{th}$, r^{th} and $(r + 1)^{th}$ terms in the expansion of $(x + 1)^n$ are in the ratio of 1:3:5. Find 'n' and 'r'

Or

Show that $9^{n+1} + 8n - 9$ is divisible by 64, whenever 'n' is positive integer.

Q.No.3. Find the equation of circle passing through the points (2,3) and (-1,1) and whose centre is on the line $x - 3y - 11 = 0$

or

Find the coordinates of the foci, the vertices, the length of major and minor axes, the eccentricity and the length of the Latus Rectum of the ellipse

$$\frac{x^2}{36} + \frac{y^2}{16} = 1$$

Q.No.4. Compute the derivative of $\sin x$ from the first principle.

Or

Find the derivative of; $\frac{\sin x + \cos x}{\sin x - \cos x}$

Q.No.5. Find the mean deviation about the mean for the following data;

x_i	2	5	6	8	10	12
f_i	2	8	10	7	8	5

Or

Calculate the mean, variance and the standard deviation for the following distribution;

Class:	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency:	3	7	12	15	8	3	2

Section (B) Short Answer Type Questions (10QX4M=40Marks)

Q.No.6. If $U = \{1,2,3,4,5,6,7,8,9\}$, $A = \{2,4,6,8\}$ and $B = \{2,3,5,7\}$. Verify that;

$$(I) (A \cup B)' = A' \cap B'$$

$$(II) (A \cap B)' = A' \cup B'$$

Q.No.7. Determine the domain and range of the relation R defined by:

$$R = \{(x, x + 5) : x \in \{1,2,3,4,5\}\}$$

Q.No.8. Prove that: $\frac{\sin 5x + \sin 3x}{\cos 5x - \cos 3x} = \tan 4x$

Q.No.9. Prove that: $1^3 + 2^3 + 3^3 + \dots + n^3 = \left[\frac{n(n+1)}{2}\right]^2$ by using principle of Mathematical induction.

Q.No.10. Convert the given complex number into the polar form;

$$Z = \sqrt{3} + i$$

Q.No.11. Find the value of 'x' if $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$

Q.No.12. Find the sum of the sequence; 8, 88, 888, 8888, n-terms.

Q.No.13. If $p(a, b)$ is midpoint a line segment between axes. Show that the equation of the line $\frac{x}{a} + \frac{y}{4} = 2$

Q.No.14. Find the ratio in which $YZ - plane$ divides the line segment formed by the joining the points $(-2, 4, 7)$ and $(3, -5, 8)$

Q.No.15. If E and F are the events such that $P(E) = \frac{1}{4}$; $P(F) = \frac{1}{2}$

and $p(E \text{ and } F) = \frac{1}{8}$. Find;

$$(I) P(E \text{ or } F)$$

$$(II) P(\text{Not } E \text{ and Not } F)$$

Q.No.16. Write down the all subsets of $A = \{a, b\}$

Q.No.17. Find the range of the function $f(x) = 2 - 3x; x \in R$

Q.No.18. Find the value of 'r' is $5P_r + 6P_{r-1}$

Q.No.19. Find first five terms of sequence $a_n = n\left(\frac{n^2+5}{4}\right)$

Q.No.20. Reduce the equation $6x + 3y - 5 = 0$

Q.No.21. Find the equation of parabola whose focus is (6,0) and the directrix $x = -6$.

Q.No.22. Evaluate the limit; $\lim_{n \rightarrow 0} \frac{\sin ax + bx}{ax + \sin bx}$, a, b, $a+b \neq 0$

Q.No.23. Write the negation of the following statements;

(I) Srinagar is a city (II) $\sqrt{7}$ is a radicle

Q.No.24. Write the converse of the following statements;

(I) If 'n' is even, then n^2 is even

(II) If a number is divisible by 10, It is divisible by 5/.

Q.No.25. If $P(A) = \frac{1}{4}$ then what is $p(\text{not } A)$?

Section (C) Very Short Answer Type Questions (10QX1M=10Marks)

Q. No. 26. Choose the most appropriate answer.

(I) The general solution of the equation $\sin x = 0$

(a) $x = 2n\pi$

(b) $x = n\pi$

(c) $x = (2n + 1)\frac{\pi}{2}$

(d) *None of these*

(II) The value of; $\frac{\sin 31\pi}{3}$ is;

(a) $\frac{\sqrt{3}}{2}$

(b) $\frac{1}{2}$

(c) $\sqrt{3}$

(d) 1

(III) The set of values of 'x' which satisfy $5x + 2 < 3x + 8$ and $\frac{x+2}{x-1} < 4$ is;

(a) (2,3)

(b) $(-\infty$

(c) ((2,3)

(d) (1.3)

(IV) If AM, GM and HM are arithmetic mean, Geometric mean and Harmonic means of any two positive real numbers, then;

- (a) $AM \leq GM \leq HM$ (b) $AM < GM < HM$
(c) $AM > GM > HM$ (d) $AM \geq GM \geq HM$

(V) The coordinates of the foci of hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$

- (a) $(0 \pm \sqrt{17})$ (b) $(\pm\sqrt{17}, 0)$
(c) $(\sqrt{17}, 0)$ (d) $(-\sqrt{17}, 0)$

(VI) A hyperbola in which $a = b$ is called an equilateral hyperbola
(True/ False)

(VII) The value of $\lim_{n \rightarrow 0} \frac{\sin x}{x}$ (Where 'x' is in radians) is = 0
(True/False)

(VIII) The value of; $\lim_{n \rightarrow \infty} \frac{x^n - a^n}{x - a} = na^{n-1}$ (True/False)

(IX) The sum of n-terms of a GP, when $r > 1$

- (a) $\frac{a}{1-r}$ (b) $\frac{n}{2} [2a + (n - 1)d]$
(c) $\frac{a(r^n - 1)}{r - 1}$ (d) ar^{n-1}

(X) The least positive integral vale of 'm' for which $\left[\frac{1+i}{1-i} \right]^m = 1$, is

- (a) 1 (b) 2
(c) 3 (d) 4

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