

Model Paper Class 11<sup>th</sup> Class: 11<sup>th</sup>

Exam: Hr. Sec. Part I

Max Marks: 100

Subject: Applied Mathematics

Time: 3 Hours

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

Q.No.1. If  $\alpha$  and  $\beta$  are different complex number with  $|\beta|=1$ . Find;  $\left| \frac{\beta-\alpha}{1-2\beta} \right|$

Or

Convert the complex number  $Z = \frac{i-1}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$  in the polar form.

Q.No.2. Sum of first p, q and r terms of an A.P are a, b and c respectively. Prove that;  $\frac{a}{q}(q-r) + \frac{b}{q}(r-p) + \frac{c}{r}(p-q) = 0$

Or

Find the sum of the sequence 7, 77, 777, ... to n terms.

Q.No.3. Solve for general and principal solution of the equation;

$$\sin 2x - \sin 4x + \sin 6x = 0$$

Or

$$\text{Prove that; } \cos x \cos \frac{x}{2} + \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}$$

Q.No.4. Find 'n' if; (I)  $(n-1)P_3 : nP_4 = 1:9$

$$(II) 2n_{C_3} : n_{C_3} = 12:1$$

Or

The coefficient of  $(r-1)^{th}$ ,  $r^{th}$  and  $(r+1)^{th}$  terms in the expansion of  $(x+1)^n$  are in the ratio 1:3:5. Find n and r

Q.No.5. Find the equation of a line passing through the points (2,2) and cutting off intercepts on the axes whose sum is

Or

33

If  $p$  and  $q$  are the lengths of perpendiculars from the origin to the line  $x \cos \theta - y \sin \theta = k \cos 2\theta$  and  $x \sec \theta + y \operatorname{cosec} \theta = k$  respectively. Prove that  $p^2 + 4q^2 = k^2$

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

Q.No.6. Find the subsets of the set  $A = \{1, 2, 3\}$

Q.No.7. If  $f = \left\{ \left( x, \frac{x^2}{1+x^2} \right) : x \in R \right\}$  be a function from  $R$  to  $R$ . Determine the range of  $f$

Q.No.8. Express the following in the form of  $a + ib$

$$\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+2i)(\sqrt{3}-2i)}$$

Q.No.9. Find the sum of 'n' terms of an A.P whose  $k^{\text{th}}$  term is  $5k - 1$

Q.No.10. How many 3-digit numbers can be formed using the digits 1 to 9 if no digit is repeated.

Q.No.11. Find the middle term in the expansion of;  $\left( 3 - \frac{x^3}{6} \right)^7$

Q.No.12. Point  $R(h, k)$  divides a line segment between the axes in the ratio 1:2.

Find the equation of the line.

Q.No.13. A letter is chosen at random from the word "ASSASSINATION". Find the probability that letter is:

(I) a vowel

(II) a consonant

Q.No.14. If  $A$  and  $B$  are the events such that  $P(A) = 0.42$ ,  $P(B) = 0.48$  and

$P(A \text{ and } B) = 0.16$ . Determine;

(I)  $P(\text{not } A)$

(II)  $P(A \text{ or } B)$

Q.No.15. Find:

(I) Dot product of  $\vec{a} = 3\hat{i} + 2\hat{j} - 6\hat{k}$  and  $\vec{b} = 2\hat{i} + 4\hat{j} + 6\hat{k}$

(II) Cross product of;  $\vec{a} = 2\hat{i} + \hat{k}$  and  $\vec{b} = \hat{i} - \hat{j}$

**Section (C) Very Short Answer Type Questions (10QX2M=20Marks)**

Q.No.16. If  $A = \{a, b, c, d\}$ ,  $B = \{c, d, e, f\}$  Find  $A \cup B$

Q.No.17. If  $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$ . Find 'x' and 'y'

Q.No.18. Find the multiplicative inverse of  $Z = \sqrt{5} + 3i$

Q.No.19. Find first four terms of sequence  $a_n = (-1)^{n-1} 5^{n+1}$

Q.No.20. Find the degree measure of  $\frac{5\pi}{3}$  radians

Q.No.21. Find the value of  $\sin \frac{-11\pi}{3}$

Q.No.22. Find the slope of the line passing through origin and (2,3)

Q.No.23. Find the sample space when a coin is tossed twice.

Q.No.24. Define unit vector. Give an example.

Q.No.25. Check if the vectors  $\vec{a} = 3\hat{i} + 2\hat{j}$  and  $\vec{b} = 2\hat{i} - 3\hat{j}$  are orthogonal.

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

Q. No. 26. Do as directed.

(I) If A set has n elements. Then the number of subsets is

(a)  $n^2$

(b)  $2^n$

(c)  $An + 2$

(d)  $2n$

(II) Polynomial equation of degree n has n roots. (True/False)

(III) The nth term of the sequence  $1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + \dots$  is .....

(IV) For any real numbers 'x' and 'y',  $\sin x = \sin y$ , implies

(a)  $x = y$

(b)  $x = n\pi + (-1)^n y$

(c)  $n\pi + (-1)^n y$

(d)  $x = \frac{\pi}{2} + y$

(V) The value of  $n_{C_r} + n_{C_{r-1}}$  is

(a)  $n_{C_r}$

(b)  $n_{C_0}$

(c)  $n_{C_r}$

(d)  $n_{C_{r+1}}$

(VI) Two lines are perpendicular if the product of their slopes is;

(a) 0

(b) -1

(c) 1

(d) either 1 or 0

(VII) If  $P$  is the probability of an event  $E$ . Then which of the following is true?

(a)  $0 < P < 1$

(b)  $0 \leq p < 1$

(c)  $0 < p \leq 1$

(d)  $0 \leq P \leq 1$

(VIII) If  $A$  and  $B$  are two independent events, then  $P(A \cap B) = \dots$

(a)  $P(A)P(B)$

(b)  $P(A) + P(B)$

(c)  $0$

(d) *None of these*

(IX) The commutativity of dot product of two vectors  $\vec{a}$  and  $\vec{b}$  implies

(a)  $\vec{a} + \vec{b} = \vec{b} + \vec{a}$

(b)  $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{a}$

(c)  $\vec{a} \times \vec{b} = \vec{b} \times \vec{a}$

(d)  $\vec{a} \cdot \vec{b} = \vec{b} \times \vec{a}$

(X) The magnitude of the vector  $\vec{a} = \vec{i} + \vec{j} + \vec{k}$  is

(a)  $\sqrt{3}$

(b)  $\sqrt{5}$

(c)  $0$

(d)  $\sqrt{3}$