

CLASS: XI

MATHEMATICS

TIME: 3HRS

MAXMARKS:80

SECTION-A

Answer all questions

I

1. For what value of 'a' and 'b' are  $(1-i)a + (1+i)b$  and  $(1-3i)$  equal?
2. Expand using binomial theorem  $(x^2 + 3/x)^4$ .
3. Show that the points A(4,8) B(5,12) C(9,28) are collinear.
4. Find the square root of  $(-15-8i)$ .
5. Find 'a' if 17<sup>th</sup> and 18<sup>th</sup> terms in the expansion of  $(2+a)^{50}$  are equal. (5 × 2)

II 1. The vertices of  $\Delta$  PQR are P(2,1) Q(-2,3) and R (4,5). Find the equation of the median through R.

2. If the coefficient of  $(r-5)^{\text{th}}$  term and  $(2r-1)^{\text{th}}$  in  $(1+x)^{34}$  are equal. Find the value of r? (3 × 2)

III

1. if  $1, \omega, \omega^2$  are cube roots of unity. Prove that  $(x-y)(\omega x - \omega^2 y)(\omega^2 x - \omega y) = x^3 - y^3$ .
2. Find the equation of the lines which cut off intercepts on the axes whose sum and product are 1 and -6 respectively. (3 × 2)

IV

1. If p is a real number and if the middle term in the expansion of  $(\frac{p}{2} + 2)^8$  is 1120. Find p?
2. Find the modulus and amplitude of the complex number  $\frac{-16}{1+i\sqrt{3}}$  (3 × 2)

V

1. If the angle between two lines is  $\frac{\pi}{4}$  and the slope of one of the lines is  $\frac{1}{2}$ . Find the slope of the other line?
2. Find the term independent of x in the expansion of  $(\frac{3x^2}{2} - \frac{1}{3x})^6$ . (3 × 2)

VI

1. Find the equation of a line which is perpendicular to  $x-7y+5=0$  and having x intercept 3?
2. Find  $(x+1)^6 + (x-1)^6$ . Hence evaluate  $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$ . (3 × 2)

### SECTION-B

1. If  $f(x) = \frac{x^2-4}{x-2}$ , then find i)  $\lim_{x \rightarrow 2} f(x)$  ii)  $f'(x)$
2. Find the derivative of  $5\sin x - 6\cos x + 7$ .
3. If  $y = \frac{x^2+3}{x^3+2x}$ , find  $\frac{dy}{dx}$  at  $x = 1$
4. Prove that  $\cos 130^\circ \cos 40^\circ + \sin 130^\circ \sin 40^\circ = 0$
5. Prove that  $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 8x}}} = 2\cos x$  (6 × 3)
6. Show that  $\sin 105^\circ + \cos 105^\circ = \frac{1}{\sqrt{2}}$
7. Show that  $2 \tan 2x = \frac{\cos x + \sin x}{\cos x - \sin x} - \frac{\cos x - \sin x}{\cos x + \sin x}$
8. Find the value  $\sin 2\theta, \cos 2\theta, \tan 2\theta$ , given  $\sin \theta = 3/5$ ,  $\theta$  in quadrant II
9. Find the derivative of  $\frac{\sin x + \cos x}{\sin x - \cos x}$  (3 × 4)
10. Evaluate the following limits
  - i.  $\lim_{x \rightarrow 2} \left( \frac{x^3 - 2x^2}{x^2 - 5x + 6} \right)$
  - ii.  $\lim_{x \rightarrow 0} \left( \frac{e^x + \sin x - 1}{x} \right)$
  - iii.  $\lim_{x \rightarrow 1} (1 + x + x^2 + x^3 + \dots + x^{100})$ .
  - iv.  $\lim_{x \rightarrow 0} \frac{e^{ax} - 1}{\sin x}$ .
  - v.  $\lim_{x \rightarrow 3} \frac{x^5 - 243}{x^2 - 9}$  (10)