

- (1) $\frac{-i}{1+i}$ (3) $\frac{i-1}{2}$
- (2) $\frac{1-i}{i}$ (4) None of these
- g) Real part of $\cosh z$ is (01)
- (1) $\cosh x \cos y$ (3) $\cos h x \sin y$
- (2) $\sinh x \sin y$ (4) $\sinh x \cos y$
- h) If $z = \cos \theta + i \sin \theta$, then $\sin n\theta = \dots\dots\dots$ (01)
- (1) $\frac{z^n + z^{-n}}{2}$ (3) $\frac{z^n - z^{-n}}{2i}$
- (2) $\frac{z^n - z^{-n}}{2}$ (4) None of these
- i) If $x + iy = \sqrt{2} + 3i$, then $x^2 + y^2$ is (01)
- (1) 7 (3) 13
- (2) 5 (4) $\sqrt{2} + 3$
- j) The real part of $(\sin x + i \cos x)^5$ is (01)
- (1) $-\cos 5x$ (3) $\sin 5x$
- (2) $-\sin 5x$ (4) $\cos 5x$
- k) General equation to the cone which passes through the axes is (01)
- (1) $ax^2 + by^2 + cz^2 = 1$ (3) $fyx + gzx + hxy = 1$
- (2) $ax^2 + by^2 + cz^2 = 0$ (4) $fyx + gzx + hxy = 0$
- l) The equation of the enveloping cone can be written as: (01)
- (1) $S = T^2$ (3) $T = S_1$
- (2) $SS_1 = T^2$ (4) None of these
- m) Guiding curve of a right circular cylinder is (01)
- (1) ellipse (3) pair of straight lines
- (2) circle (4) any closed curve
- n) The equation $\frac{x^2}{2} - \frac{y^2}{3} = z$ represents: (01)
- (1) cylinder (3) ellipsoid
- (2) hyperboloid (4) paraboloid

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions (14)

- a) Find the equation of cone whose vertex is (α, β, γ) and base $ax^2 + by^2 = 1, z = 0$. (05)
- b) Describe and sketch the conicoid $\frac{x^2}{9} - \frac{y^2}{16} - \frac{z^2}{9} = 1$. (05)
- c) Find the equation of a cylinder whose generating lines have the direction cosine (l, m, n) and which passes through the circle $x^2 + z^2 = a^2, y = 0$. (04)

Q-3 Attempt all questions (14)

- a) Find the equation of the enveloping cylinder of the sphere $x^2 + y^2 + z^2 = 25$, whose generators are parallel to the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$. (05)
- b) Prove that the equation $2y^2 - 8yz - 4zx - 8xy + 6x - 4y - 2z + 5 = 0$ (05)



represents a cone whose vertex is $\left(-\frac{7}{6}, \frac{1}{3}, \frac{5}{6}\right)$.

c) Define: $\log(x + iy)$. Determine $\log(1 - i)$. (04)

Q-4 **Attempt all questions** (14)

a) Prove that the n^{th} root of unity are in a geometric progression. Also show that their sum is zero. (05)

b) Separate real and imaginary parts of $\tan(x - iy)$. (05)

c) Solve: $y'' + 16y = x^4 + e^{3x} + \cos 3x$. (04)

Q-5 **Attempt all questions** (14)

a) Solve: $(x^2 D^2 - 3xD + 4)y = x^2$, given that $y(1) = 1$ and $y'(1) = 0$. (05)

b) Solve: $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 8y = x^2$. (05)

c) Solve: $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = e^{-3x}$. (04)

Q-6 **Attempt all questions** (14)

a) State and prove De-Moivre's theorem. (05)

b) Prove that $\sinh^{-1}(z) = \ln(z + \sqrt{z^2 + 1})$. (05)

c) Expand $\cos^5 \theta$ in a series of cosines of multiples of θ . (04)

Q-7 **Attempt all questions** (14)

a) Solve: $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$. (05)

b) Prove that the cones $ax^2 + by^2 + cz^2 = 0$ and $\frac{x^2}{a} + \frac{y^2}{b} + \frac{z^2}{c} = 0$ are reciprocal. (05)

c) Prove that $\cos 6\theta = 32 \cos^6 \theta - 48 \cos^4 \theta + 18 \cos^2 \theta - 1$. (04)

Q-8 **Attempt all questions** (14)

a) Solve the simultaneous equations $\frac{dx}{dt} + 2y + \sin t = 0$, $\frac{dy}{dx} - 2x - \cos t = 0$ given that $x = 0$ and $y = 1$ when $t = 0$. (05)

b) Solve: $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10 \left(x + \frac{1}{x}\right)$. (05)

c) Identify the surface given by $9x^2 + 4y^2 - 9z^2 - 18x - 8y - 18z = 32$. (04)

