

Complex Numbers

Q.1 Evaluate (i) $i^{17} + i^{20} - i^{13}$ (2 marks)

(ii) $(-i)^{4n+3}$

Q.2 Find the value of $x \times y$ if $x + y + i = 3 + (x - y)i$

Q.3 Find the conjugate, modulus & argument of $\frac{1}{1-i}$, $\frac{3+2i}{4-3i}$ (5 marks).

Q.4 If $x + \frac{1}{x} = 2 \cos \theta$, find the value of x (5 marks)

Q.5 P.T. (i) $(1 - \omega + \omega^2)^7 + (1 + \omega - \omega^2)^7 = 128$

(5 marks) (ii) $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5 = 32$

(iii) $(1 + 5\omega^2 + \omega^4)(1 + 5\omega + \omega^2)(5 + \omega + \omega^2) = 64$

Q.6 Find square roots of (10 marks).

(i) $-15 - 8i$ (ii) $-5 + 12\sqrt{11}$

Q.7 If $x + \frac{1}{x} = 2 \cos \theta$, show that

(a) $x^n + \frac{1}{x^n} = 2 \cos n\theta$ (b) $x^n - \frac{1}{x^n} = 2i \sin n\theta$

Numerical Analysis

Q.1 Find by Newton's method, a root of the eqⁿ $x^3 - 3x + 1 = 0$; correct upto 3 decimal places. (5 marks)

Q.2 Find a root of 28 using bisection method correct upto 2 decimal places (5 marks).

Q.3 Find missing values. (5 marks)

$$x: 0 \quad 5 \quad 10 \quad 15 \quad 20 \quad 25$$

$$y: 6 \quad 10 \quad - \quad 17 \quad - \quad 31$$

Q.4 Evaluate (i) $\Delta(x + \cos x)$ (2 marks).

(ii) $\Delta(\tan^{-1} x)$

Q.5 Define shift operator and

written down the relation between

$$\Delta, \nabla \text{ \& } E. \quad (2 \text{ marks})$$

Q.6 using Lagrange's interpolation, fit a polynomial. (5 marks),

$$f(0) = 1, \quad f(1) = 3, \quad f(3) = 55$$

Q.7 If $y(75) = 246$, $y(80) = 202$, $y(85) = 118$
and $y(90) = 40$, find $y(79)$ using Newton's
forward interpolation. (10 marks)

Q.8 find the value of y for $x = 2.65$
where

x :	-1	0	1	2	3
y :	-24	6	15	12	3

(10 Marks)

Q.9 calculate $\int_{-3}^3 x^4 dx$, by taking 7
equidistance ordinates, using Simpson's
one-third rule. (5 marks)

Q.10 calculate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal
Rule (5 marks).

Q.11 State Newton cotes. Quadrature
formula (5 marks).

Fourier Series

Q.1 State Euler's theorem. (5 marks).

Q.2 state even function, odd fun.
and periodic function with examples.

Laplace Transform

① find $L^{-1} \left\{ \frac{s}{(s-3)(s^2+4)} \right\}$ (10 marks)

② find $L^{-1} \left\{ \frac{s^2 - 10s + 13}{(s-7)(s^2 - 5s + 6)} \right\}$ (10 marks).

③ find Inverse Laplace transform.

• $\log \left(\frac{s+a}{s+b} \right)$.

Matrix

Q.7 state (i) upper triangular Matrix.

(ii) Singular Matrix

(iii) Scalar Matrix

(iv) Identity "

(v) Diagonal " with examples.

Q.2 - State rank of a Matrix.

Q.3 State Row Reduced Echelon Matrix.

Q.4 State Raouche's theorem.

Q.5 find the rank of the followings:

(i)
$$\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$$

(ii)
$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$$

Q.6 check whether the following system of equation consistent or not.

$$x + y + 2z + w = 5$$

$$2x + 3y - z - 2w = 2$$

$$4x + 5y + 3z = 7$$

Q.7 For what value of λ , the eqⁿ

$$x + y + z = 1$$

$$x + 2y + 4z = \lambda$$

$$x + 4y + 10z = \lambda^2$$

has a solution & solve them completely in each case.

Q.8 Check whether the following system of eqⁿ is consistent or not. Solve if consistent.

$$4x + 3y + 2z = -7$$

$$2x + y - 4z = -1$$

$$x + 2y + z = 1$$

Q.9 For what value of λ & all the eqⁿs.

$$x + 2y + z = 8, \quad 2x + y + 3z = 13, \quad 3x + 4y - \lambda z = \lambda$$

have (i) no solⁿ (ii) unique solⁿ (iii) infinitely many solⁿ?

Q.10 Solve the following eq^s.

$$x + 3y - 2z = 0$$

$$2x - y + 4z = 0$$

$$x - 11y + 14z = 0$$