

**Question Bank (G scheme)**

Name of subject: Engg.Mathematics  
Subject code: 17216  
Semester: II

Unit Test :I  
Course : CM/IF

**Chapter 1 (COMPLEX NUMBER)[14 MARKS]**

**3 marks-**

- 1) Find modulus and amplitude of  $-1 + i\sqrt{3}$
- 2) Find modulus and amplitude of  $1 + \cos \theta + i \sin \theta$
- 3) If  $Z_1 = 4 - 5i$  and  $Z_2 = 3 + 7i$  find  $|3Z_1 - 2Z_2|$  and  $\left| \frac{Z_1}{Z_2} \right|$
- 4) If  $Z = 1 + 2i$  find value of  $Z^2 - 2Z + 6$
- 5) Using Euler's theorem prove that  $\sin^2 \theta + \cos^2 \theta = 1$
- 6) Using Euler's theorem prove that  $\sin 2\theta = 2 \sin \theta \cos \theta$
- 7) Express in  $(x + iy)$  form  $\frac{2-3i}{1+2i}$

**4 marks-**

- 1) Express in polar form  $(-2 - 2\sqrt{3} i)$
- 2) Find cube root of unity.
- 3) Find all roots of  $(1 + \sqrt{3} i)^{1/3}$
- 4) If  $\cos(A + iB) = x + iy$  the show that
  - i)  $\frac{x^2}{\cos^2 A} - \frac{y^2}{\sin^2 A} = 1$
  - ii)  $\frac{x^2}{\cosh^2 A} + \frac{y^2}{\sinh^2 B} = 1$
- 5) Separate into real part and imaginary part  $\cosh(x + iy)$
- 6) Simplify using De-Moivre's Theorem
$$\frac{(\cos 5\theta - i \sin 5\theta)^{2/5} (\cos \frac{2}{7}\theta + i \sin \frac{2}{7}\theta)^7}{(\cos 4\theta + i \sin 4\theta)^{1/4} (\cos \frac{2}{3}\theta - i \sin \frac{2}{3}\theta)^3}$$
- 7) Simplify using De-Moivre's Theorem
$$\frac{(\cos 3\theta + i \sin 3\theta)^4 (\cos 4\theta + i \sin 4\theta)^2}{(\cos 4\theta - i \sin 4\theta)^3 (\cos 5\theta - i \sin 5\theta)^{-4}}$$

**Chapter- 2(FUNCTION)[14 MARKS]**

**3 marks:**

- 1) If  $f(x) = \frac{x^2+9}{\sqrt{x-3}}$  find  $f(4) + f(5)$
- 2) If  $f(x) = x^3 + x$  find  $f(1) + f(2)$
- 3) Show that  $f(x) = 4x^4 + 3 \cos x + x \sin x + 1$  is an even function.
- 4) If  $f(x) = x^3 - \frac{1}{x^3}$  show that  $f(x) + f\left(\frac{1}{x}\right) = 0$
- 5) If  $f(x) = ax^2 - bx - 1$ ,  $f(2) = 5$ ,  $f(-2) = 10$  then find 'a' and 'b'.

**4 marks:**

- 1) If  $f(x) = \frac{x+3}{4x-5}$  and  $t = \frac{3+5x}{4x-1}$  show that  $f(t) = x$ .
- 2) If  $f(x) = \frac{3x+4}{4x-1}$  show that  $(f \circ f)(x) = x$ .
- 3) If  $f(x) = \log\left(\frac{1+x}{1-x}\right)$  show that  $f(a) + f(b) = f\left(\frac{a+b}{1+ab}\right)$ .

**Chapter- 3 (LIMIT)[20 MARKS]**

**3 marks:**

- 1) Evaluate :

$$\lim_{x \rightarrow 2} \frac{x^2 - 10x + 16}{x^2 + 3x - 10}$$

- 2) Evaluate :

$$\lim_{x \rightarrow 2} \left[ \frac{1}{x-2} - \frac{2}{x^2-2x} \right]$$

**4 marks:**

- 1) Evaluate :

$$\lim_{x \rightarrow 1} \frac{x^3 + 3x^2 - 6x + 2}{x^3 + 3x^2 - 3x - 1}$$

- 2) Evaluate :

$$\lim_{x \rightarrow 1} \left[ \frac{x+1}{x-3} - \frac{x+5}{x^2-4x+3} \right]$$

- 3) Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$$

4) Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sqrt{x+9} - 3}{\sqrt{x+16} - 4}$$