

Question Bank (G scheme)

Name of subject: Engg. Mathematics
Subject code: 17216

Unit Test : I
Course : CM/IF/EJ/IE/IS

Semester: II

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 :

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