Total No. of Questions – [4]   Total No. of Printed Pages 2

G.R. No.	

SEPTEMBER 2017 / IN - SEM (T1)

F. Y. B.TECH. (COMMON) (SEMESTER - I)

COURSE NAME : Engineering Mathematics-I

(2017 PATTERN)

Time : [1 Hour]   [Max. Marks : 30]

Instructions to candidates:
1) Answer Q.1 OR Q.2, Q.3 OR Q.4
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed
4) Use suitable data where ever required

Q 1) a) Solve: $x + 2y + 3z = 0$; $x + 2y + z = 0$; $x + 5y + 4z = 0$; $x + y - 2z = 0$ [6]

b)   Find the Eigen values and Eigen vectors for the matrix $\begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$ [6]

c) Reduce the following matrix to Normal form and hence find its rank.   [4]

$$\begin{bmatrix} 1 & -2 & -1 & 3 \\ 3 & 4 & 0 & -1 \\ -1 & 0 & -2 & 7 \end{bmatrix}$$

OR

Q2)   a)   Test the following vectors for linear dependence and find a relation   [6]
between them if dependent (2,3,-1,-1) , (1,-1,-2,-4) , (3,1,3,-2), (6,3,0,-7)
b) Find the Eigen values and Eigen vectors for the matrix

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$ [6]

c)   Reduce the following matrix to Row Echelon form and hence find its rank
$$\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & 1 & -3 & 4 \end{bmatrix}$$ [4]

Q3) a) If $|z| = 1$, $z \neq 1$, prove that $\dfrac{z-1}{z+1}$ is purely imaginary. [6]

b) Using De Moivre's Theorem, Prove that
$$\left(1 + i\sqrt{3}\right)^8 + \left(1 - i\sqrt{3}\right)^8 = -256.$$ [4]

c) Prove that real part of the principal value of $i^{\log(1+i)}$ is $e^{\frac{-\pi^2}{8}} \cos\left(\frac{\pi}{4}\log 2\right)$. [4]

OR

Q4) a) Solve the equation $x^7 + x^4 - x^3 - 1 = 0$. [6]

b) If $\operatorname{cosec}\left(\dfrac{\pi}{4} + ix\right) = u + iv$, then prove that $\left(u^2 + v^2\right)^2 = 2\left(u^2 - v^2\right)$. [4]

c) Prove that $\cos\left[i\log\left(\dfrac{a+ib}{a-ib}\right)\right] = \dfrac{a^2 - b^2}{a^2 + b^2}$. [4]