Code No.: **10M07/20M07**

MR11 / MR12

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2018

Subject: **Mathematics - II**

Branch: **CE**

Time: 3 hours **Max. Marks: 75**

Answer any **FIVE** Questions of the following **5x15M=75M**

1. a) For what value of k the matrix $\begin{bmatrix} 4 & 4 & -3 & 1 \\ 1 & 1 & -1 & 0 \\ k & 2 & 2 & 2 \\ 9 & 9 & k & 3 \end{bmatrix}$ has rank 3. **[5M]**

   b) Discuss for what values of λ, μ the simultaneous equations $x+y+z=6$, $x+2y+3z=10$, $x+2y+\lambda z=\mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. **[10M]**

2. Verify Cayley-Hamilton Theorwm for $A=\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 2 & 3 & 0 \end{bmatrix}$ **[15M]**

3. a) Show that the matrix $\frac{1}{\sqrt{3}}\begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$ is unitary, Find the eigen values and eigen vectors. **[7M]**

   b) Reduce the quadratic form $7x^2 + 6y^2 + 5z^2 - 4xy - 4yz$ to the canonical form. **[8M]**

4. a) Determine the Fourier series expansion of the function $f(x) = \frac{1}{12}(3x^2-6x\pi + 2\pi^2)$ in the interval $(0, 2\pi)$. **[7M]**

   b) Obtain the Fourier series for the function $f(x) = |x|$ in $-\pi<x<\pi$ and hence deduce that $1/1^2+1/3^2+1/5^2+\ldots\ldots = \pi^2/8$. **[8M]**

5. a) Form the partial differential equation by eliminating the arbitrary constants and function from the following.

   i) $(x-a)^2+(y-b)^2+z^2=\gamma^2$ (ii) $z=x^2\emptyset(x - y)$ **[7M]**

   b) i) Solve the partial differential equation $z(x-y)=px^2-qy^2$

   ii) Solve $z^2(p^2x^2+q^2)=1$. **[8M]**

6. Solve $3u_x+2u_y = 0$ with $u(x,0) = 4e^{-x}$ by the method of separation of variables. **[15M]**

7. a) Find Fourier sine transforms of $f(x) = 1/x$ **[8M]**

   b) Find the fourier transforms of $f(x) = xe^{-x}$, $0 \le x < \infty$. **[7M]**

8. a) Using Z-transform solve the following difference equation. **[10M]**

   $u_{n+2} - 2u_{n+1} + u_n = 2^n$ with $u_0 = 2$, $u_1 = 1$

   b) Find inverse Z-transform of $\frac{z}{(z+3)^2(z+2)}$. **[5M]**