B.Tech I Year II Semester (R15) Regular & Supplementary Examinations May/June 2017
MATHEMATICS – II
(Common to all)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
- (a) Find $L\left[t^2 . e^t . \cos 4t\right]$
- (b) Define unit step function Laplace transform.
- (c) If $f(x) = x^4$ in $(-1,1)$ then find the Fourier coefficient of b_n.
- (d) What is Fourier even function $(-\pi, \pi)$?
- (e) Write the Fourier sine transform of $f(t)$.
- (f) Find the value of $Z(a^n \cos nt)$
- (g) Find the general solution of $u_{xx} = xy$.
- (h) Find the Z-transform of the sequence {x(n)} where x(n) is $n.2^n$
- (i) Find $z^{-1}\left(\frac{1}{z-3}\right)$.
- (j) What do you mean by steady state and transient state?

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   (a) Apply convolution theorem for $L^{-1}\left(\frac{1}{s^3(s^2+1)}\right)$.

    (b) Evaluate $L\left(e^{-1}\int_0^t \frac{\sin t}{t}\, dt\right)$.

OR

3   Solve $\frac{d^2x}{dt^2} + 9x = \cos 2t$, if $x(0) = 1,\ x\left(\frac{\pi}{2}\right) = -1$.

UNIT – II

4   Find the Fourier series expansion of $f(x) = 2x - x^2$ in (0, 3) and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots \infty = \frac{\pi}{12}$.

OR

5   Obtain half range cosine series for $f(x) = \begin{cases} kx & , 0 \le x \le \frac{l}{2} \\ k(l-x), & \frac{l}{2} \le x \le l \end{cases}$. Deduce the sum of the series $\frac{1}{1^2} - \frac{1}{3^2} + \frac{1}{5^2} + \cdots \infty$.

UNIT – III

6   (a) Find the Fourier sine transform of $e^{-|x|}$.
    (b) Write the conditions of Parseval's identity for Fourier transforms.

OR

7   Verify convolution theorem for $f(x) = g(x) = e^{-x^2}$.

UNIT – IV

8   (a) Form the partial differential equation $z = f\left(\frac{xy}{2}\right)$ by eliminating the arbitrary function.

    (b) Use the method of separation of variables, solve $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$ where $u(x,0) = 8e^{-3y}$.

OR

9   Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions $u(0,y) = u(i,y) = u(x,0) = 0$ and $u(x,a) = \sin\left(\frac{n\pi x}{l}\right)$.

UNIT – V

10   (a) Find the z-transformation of $\sin n\theta$.

    (b) If $U(z) = \frac{2z^2 + 5z + 14}{(z-1)^4}$, evaluate U_2, U_3 using initial value theorem.

OR

11   Solve the differential equation $u_{n+2} - 2u_{n+1} + u_n = 3n + 5$ using z-transforms.