Code: 15A54201 **R15**

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)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Find $L\,[t^2.e^t.cos4t]$
(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.

*****