

B.Tech I Year II Semester (R15) Supplementary Examinations December 2016

MATHEMATICS – II

(Common to all)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Write the conditions for existence of Laplace transform of a function.
 - Define Unit Impulse function.
 - Write Dirichlet conditions for Fourier series.
 - Write the Parseval's formula for Fourier series.
 - Write the complex form of Fourier integral.
 - Write any two properties of Fourier transform.
 - What are the assumptions to be made for one dimensional wave equation?
 - What do you mean by steady state and transient state?
 - Find the Z-transform of $\frac{1}{n}$.
 - Find $Z^{-1} \left\{ \frac{z^2 - 2z}{(z-1)^2} \right\}$.

PART – B

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

UNIT – I

- 2 (a) Find the Laplace transform of $f(t) = |t-1| + |t+1|, t \geq 0$.
- (b) Use Laplace transform to evaluate $L \left\{ \int_0^{\infty} \frac{e^{-t} \sin t}{t} dt \right\}$.

OR

- 3 (a) Apply Convolution theorem to evaluate $L^{-1} \left\{ \frac{s}{(s^2 + a^2)^2} \right\}$.
- (b) Solve $ty'' + 2y' + y = \cos t, y(0) = 1$.

UNIT – II

- 4 Find the Fourier series for $f(x) = 1 + x + x^2$ in $(-\pi, \pi)$. Hence deduce that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$.

OR

- 5 (a) Expand $f(x) = \cos x, 0 < x < \pi$ in a Fourier Sine series.
- (b) Find the complex form of the Fourier series of $f(x) = e^{-x}$ in $[-1, 1]$.

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UNIT – III

- 6 (a) Find Fourier cosine transform of e^{-x^2} .
- (b) Find Fourier transform of $f(x) = \begin{cases} 1-x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$.

OR

- 7 (a) Find Fourier sine transform of $\frac{e^{-ax}}{x}$.
- (b) Find the Finite Fourier sine and cosine transform of $f(x) = 2x, 0 < x < 4$.

UNIT – IV

- 8 (a) Form the partial differential equation by eliminating the arbitrary functions f and g from:
 $Z = f(2x + y) + g(3x - y)$.
- (b) Solve by using the method of separation of variables the equation $2x \frac{\partial z}{\partial x} - 3y \frac{\partial z}{\partial y} = 0$.

OR

- 9 A rod of length 20 cm has its ends A and B kept at temperature 30°C and 90°C respectively until steady state conditions prevail. If the temperature at each end is then suddenly reduced to 0°C and maintained so, find the temperature distribution at a distance x from A at time t .

UNIT – V

- 10 (a) If $U(Z) = \frac{2z^2 + 5z + 14}{(z-1)^4}$ then find U_2 and U_3 .
- (b) Use convolution theorem to evaluate $Z^{-1} \left\{ \frac{z^2}{(z-a)(z-b)} \right\}$.

OR

- 11 Use Z-transform to solve: $y_{n+2} - 2y_{n+1} + y_n = 3n + 5$.
