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B.Tech I Year II Semester (R15) Supplementary Examinations November 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 inverse transform of $\frac{1}{s(s+4)}$

(b) Define unit impulse function of Laplace transform.

(c) If $f(x) = x^4$ in (-1, 1) then find the Fourier coefficient of a_n.

(d) Obtain the Fourier series for the function $f(x) = |x|$ in the interval $(-\pi, \pi)$.

(e) Find the Fourier cosine transform of $f(x) = e^{\frac{x^2}{2}}$.

(f) Find the Fourier sine transform of $e^{-|x|}$.

(g) Solve $p^2-q^2 = x-y$.

(h) Solve $q^2 = z^2 p^2 (1 - p^2)$.

(i) Find $Z^{-1}\left(\frac{1}{z-2}\right)$.

(j) Find Z transform of n^3.

PART – B

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

UNIT – I

2 (a) Apply Convolution theorem , Evaluate $L^{-1}\left(\frac{1}{(s+a)(s+b)}\right)$

(b) Solve $x\frac{d^2y}{dx^2}+\frac{dy}{dx}+xy=0, \quad y(o)=2, y'(0)=0$ using Laplace transform method.

OR

3 Define Periodic function. Evaluate $L\left(t\int_0^t \frac{e^{-t}\sin t}{t}dt\right)$

UNIT – II

4 Expand $f(x) = x \sin x$ as a Fourier series in the interval $(0, 2\pi)$.

OR

5 Obtain a half range sine series for the function: $f(x)=\begin{cases}\frac{1}{4}-x, & 0 \le x \le \frac{1}{2} \\ x-\frac{3}{4}, & \frac{1}{2} \le x \le 1\end{cases}$

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UNIT – III

6 (a) Find the Fourier transform of $f(x) = \begin{cases} 1-x^2, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$

Hence evaluate

$$\int_0^\infty \frac{x\cos x - \sin x}{x^3}\cos\left(\frac{x}{2}\right)dx$$

(b) Write the conditions of Parseval's identity for Fourier transforms.

OR

7 Find the Fourier sine transform of $\frac{1}{x(x^2+a^2)}$

UNIT – IV

8 (a) Form the partial differential equation $z = f_1(y+2x) + f_2(y-3x)$ by eliminating the arbitrary function.

(b) Use the method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where u(x, 0) = $6e^{-3x}$.

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 $u(0,y) = u(l,y) = u(x,0) = 0$ and $u(x,a) = \sin\left(\frac{n\pi x}{l}\right)$

UNIT – V

10 (a) Find the Z-transformation of $\cos n\theta$.

(b) If U(z)= $\frac{2z^2+3z+12}{(z-1)^4}$, 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.

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