Code: 15A54201

R15

B.Tech I Year II Semester (R15) Regular Examinations May/June 2016

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 $L\,[t^2.e^t.cos4t]$

(b) Find the Laplace Transform of $\frac{sin2t}{t}$.

(c) What are Dirichlet's conditions?

(d) Express f(x) = x as a Fourier series from $-\pi\ to\ \pi$.

(e) Write the formula of the Fourier cosine integral of f(x).

(f) Write the formula for the inverse Fourier transform of F(s) in $(-\infty,\infty)$)

(g) Find the value of $Z(a^n \cos nt)$

(h) Find the Z-transform of the sequence {x(n)} where x(n) is $n.2^n$

(i) Derive a partial differential equation by eliminating the arbitrary function f from the relation: f($x^2 + y^2, x^2 - z^2$) = 0

(j) Form the PDE from the relation z = f(x + it) + g(x-it).

PART – B

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

UNIT – I

2 Find the inverse Laplace Transform of $\frac{s}{(s^2+a^2)^2}$ by using Convolution theorem.

OR

3 Solve $(D^2 - D - 2)y = 20\ sin2t\ where\ y(0) = 1, y'(0) = 2.$

UNIT – II

4 Find a Fourier series to represent $x - x^2$ from $x = -\pi\ to\ x = \pi$ and deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$

OR

5 If $f(x) = \frac{\pi}{3},\ 0 \le x \le \pi/3$

$= 0,\ \pi/3 \le x \le 2\pi/3$

$= -\pi/3,\ 2\pi/3 \le x \le \pi$

Then $f(x) = \frac{2}{\sqrt{3}}\left[Cosx - \frac{1}{5}Cos5x + \frac{1}{7}Cos7x + ...\right]$

UNIT – III

6 Show that $\int_0^\infty \frac{\sin \pi\lambda \sin \lambda x}{1-\lambda^2} d\lambda = \frac{\pi}{2}\sin x,\ \text{for } 0 \le x \le \pi$

$= 0 \quad \text{for } x>\pi$

OR

7 Find Fourier transform of $f(x) = 1 - x^2$ for $|x| \le 1 = 0$ for $|x| > 1$ and hence find $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2} dx$

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UNIT – IV

8 Find the partial differential equation of all spheres whose centre lie on Z-axis and given by equation $x^2 + y^2 + (z-a)^2 = b^2$, a and b being constants

OR

9 A string is stretched and fastened to two points l apart. Motion is started by displacing the string in the form $y = a\, sin\frac{\pi x}{l}$ from which it is released at a time t=0. Show that the displacement of any point at a distance x from one end at time t is given by $y(x,t) = a\sin\left(\frac{\pi x}{l}\right)\cos\left(\frac{\pi ct}{l}\right)$.

UNIT – V

10 Solve the difference equation, using Z-transform $u_{n+2} - u_n = 2^n$, where $u_0 = 0$ *and* $u_1 = 1$

OR

11 If $f(z) = \frac{2z^2 + 3z + 4}{(z-3)^3}, |z| > 3$, then find the values of f(1), f(2), f(3).

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