R15

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

MATHEMATICS – II

(Common to all)

Max. Marks: 70

Time: 3 hours

PART – A

(Compulsory Question)

- 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, $5 \times 10 = 50$ Marks)

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

OR

3 Solve $(D^2 - D - 2)y = 20 \sin 2t$ where y(0) = 1, y'(0) = 2. UNIT – II

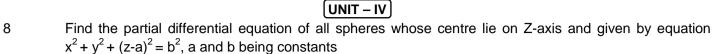
4 Find a Fourier series to represent $x - x^2$ from $x = -\pi$ to $x = \pi$ and deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$ OR

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 $\int_{-\infty}^{\infty} \frac{\sin \pi \lambda \sin \lambda x}{1 - \frac{x^2}{2}} d\lambda = \frac{\pi}{2} \sin x$, for $0 \le x \le \pi$

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

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

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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 $y(x,t) = a \sin\left(\frac{\pi x}{l}\right) \cos\left(\frac{\pi ct}{l}\right)$.

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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