**Code: 15A54201**

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 $L\left[t^2 . e^t . cos4t\right]$

(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 $f(x) = \frac{\pi}{3}, \ 0 \leq x \leq \pi/3$
              $= 0, \ \pi/3 \leq x \leq 2\pi/3$
              $= -\pi/3, \ 2\pi/3 \leq x \leq \pi$

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

UNIT – III

6        Show that $\int\limits_{0}^{\infty} \frac{\sin \pi\lambda \sin \lambda x}{1 - \lambda^2} d\lambda = \frac{\pi}{2}\sin x, \ for \ 0 \leq x \leq \pi$

                                  $= 0 \quad for \ x > \pi$

**OR**

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

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

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

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