Printed Pages : 4

|||||||||||||||||||||||||||||||||
*192 0 8 *

EAS203

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 199208

Roll No. | | | | | | | | | |

B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

MATHEMATICS - II

Time : **3** Hours]   [Total Marks : **100**

Note : Attempt all questions.

SECTION A

1   Attempt all parts of this question :   **10×2=20**

(a)   Solve : $(2D-1)^2 y = 0$ where $D = \dfrac{d}{dt}$.

(b)   Find the P.I. of $D^2 y = x^2 + 2x + 1$.

(c)   Write the generating function for $P_n(x)$.

(d)   Determine the expressin for $J_{1/2}(x)$.

(e)   Find the Laplace transform of $t^2 e^{-3t}$.

199208]   **1**   **[Contd...**

(f)   Find the function whose Laplace transform is $e^{-\pi s}\big/s^2$.

(g)   Find the constant term if $f(x) = x^2$ is expanded in Fourier series in $(-\pi, \pi)$.

(h)   Solve $\left(D^2 - 2DD' + D'^2\right)z = 0$

(i)   Classify $\dfrac{\partial^2 z}{\partial x^2} + 3\dfrac{\partial^2 z}{\partial x \partial y} + 2\dfrac{\partial^2 z}{\partial y^2} = 0$

(j)   Write one dimensional wave equation and its solution.

SECTION B

2   Attempt any three parts of the following :   3×10=30

    (a)   Solve the following sysem of simultaneous differential equations

$$\frac{dx}{dt} + x - 2y = 0, \quad \frac{dy}{dt} + x + 4y = 0;$$

$$x(0) = y(0) = 1.$$

    (b)   Solve in series : $2x^2 y'' + xy' - (x+1)y = 0$

    (c)   Using Laplace transform solve :

$$\frac{d^2 y}{dx^2} + 9y = 6\cos 3t; \quad y(0) = 2, \; y'(0) = 0$$

(d) Obtain the Fourier series for the function

$$f(x) = \begin{cases} x & , -\pi < x < 0 \\ -x & , 0 < x < \pi \end{cases}$$

hence show that $\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + \ldots\ldots = \dfrac{\pi^2}{8}$

(e) Find the temperature in a bar of length 2 whose ends are kept at zero temperature and the initial temperature is $\sin\dfrac{\pi x}{2} + 3\sin\dfrac{5\pi x}{2}$.

SECTION C

Note : Attempt any two parts from each question **(2×5)×5=50** of this section.

3 (a) Solve : $\left(D^2 + 5D - 6\right)y = \sin 3x$

(b) Solve by method of variation of parameters
$$\dfrac{d^2 y}{dx^2} + y = \sec x$$

(c) Solve : $\dfrac{d^2 y}{dx^2} - 2\tan x\dfrac{dy}{dx} + 5y = e^x \sec x$

4 (a) Prove that $P_n(-x) = (-1)^n P_n(x)$

(b) Prove that $\dfrac{d}{dx}\left(x^n J_n\right) = x^n J_{n-1}$

(c) Solve in terms of Bessel functions $4y'' + 9xy = 0$.

5   (a)   Find the Laplace transform of $te^{-2t}\sin 3t$.

      (b)   State and prove second shitting property.

      (c)   Find the inverse Laplace transform of

$$\frac{15}{s^2 + 4s + 13}.$$

6   (a)   Find the half range Fourier sine series of

$f(x) = x^2$ in $0 < x < 3$.

      (b)   Solve : $x^2 p + y^2 q = (x+y)z$

      (c)   Solve : $\left(D^2 + 3DD' + 2D'^2\right)z = e^{2x-3y}$

7   (a)   Solve by the method of separation of variables

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$$

      (b)   Find the temperature distribution in a bar of length ℓ whose ends are kept at zero temperature and initial temperature is μ_0 .

      (c)   Find the temperature distribution in a rod of length π which is totally insulated including the ends and the initial temperature distribution is $100\ \cos x$.