Printed Pages : 4

AS201

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

PAPER ID : 199201

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

B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

ENGINEERING 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 : $(3D-1)^2 y = 0$, where $D = \frac{d}{dz}$.

(b) Find the particular integral of $\left(D^2 - 4D + 2\right)y = e^{-2x}$.

(c) If $P_3(x) = \frac{1}{2}\left(Mx^3 - nx\right)$ find the value of M and n.

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

(e) Find the laplce transform of $t^3\delta(t-5)$.

(f) Find the function whose laplace transform is $\frac{1}{(s+3)^4}$.

(g) From the partial differential equation by eliminating arbitrary function $z = f\left(x^2 - y^2\right)$

(h) Solve : $(D - 5D' + 1)^2 z = 0$

(i) Classify the partial differential equation

$$2\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} - 3\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$$

(j) Find the steady state temperature distibution in a plate of length of 20 whose ends are kept at 40°C and 100°C respectively.

SECTION - B

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

(a) Solve the following simultaneous differential equation

$$\frac{dx}{dt} + 4x + 3y = t, \quad \frac{dy}{dt} + 2x + 5y = e^t$$

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

(c) Using Laplace transform solve : $y'' + 2y' + y = t e^{-t}$ under the conditions $y(0) = +1, \; y'(0) = -2$.

(d) Find fourier series for $f(x) = \begin{cases} x & , \; 0 < x < 1 \\ 1 - x & , \; 1 < x < 2 \end{cases}$

(e) Find the displacement of the finite string of length L that is fixed at both ends and is released from rest with an initial displacement $f(x)$.

SECTION - C

Note : Attempt any two parts from each question. **(2×5)×5=50**
All questions are compulsory.

3 (a) Solve : $\left(D^2 + 2D + 1\right)y = x^2 + x + 1$

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

(c) Solve by changing the independent variable $\frac{d^2y}{dx^2} - \frac{1}{x}\frac{dy}{dx} + 4x^2 y = x^4$.

4 (a) Prove that $\frac{d}{dx}\left[x^n J_n(x)\right] = x^n J_{n-1}(x)$

(b) Solve : $4y'' + 9xy = 0$ in terms of Bessel function.

(c) Prove that $\int_{-1}^{1} P_m(x) P_n(x)\, dx = 0,\ m \neq n$.

5 (a) Find the Laplace transform of $\frac{1-\cos t}{t}$.

(b) Find the inverse Laplace transform of $\frac{e^{-s}}{\sqrt{s+1}}$

(c) Evaluate $\int_0^\infty e^{-2t} t^2 \sin 3t\, dt$.

6 (a) Find the half range fourier cosine series for $f(x)=x(\pi-x)$ in $0<x<\pi$.

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

(c) Solve : $\frac{\partial^2 z}{\partial x^2}+3\frac{\partial^2 z}{\partial x\partial y}+2\frac{\partial^2 z}{\partial y^2}=12xy$

7 (a) Solve by the method of separation of variables $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u,\ u(x, 0)=6e^{-5x}$

(b) Determine the solution of one dimensional heat equation

$$\frac{\partial u}{\partial t}=C^2\frac{\partial^2 u}{\partial x^2}$$

subject to the conditions $u(0, t)=0,\quad u(\ell, t)=0,$ $u(x, 0)=0$, ℓ being the length of the bar.

(c) Solve $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ subject to the conditions

$u(0, y)=0,\quad u(a, y)=0,\quad u(x, 0)=0$ and $u(x,b)=x$.