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 $\frac{d^2y}{dx^2}-\frac{1}{x}\frac{dy}{dx}+4x^2y=x^4$.

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

(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

$u(x, b) = x$.
