Printed Pages : 4

NAS-203

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

PAPER ID : 199222

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 : $(2D-1)^3 y=0$

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

(c) If $x^3=aP_3(x)+bxP_2(x)$, find a and b.

(d) Find $J_{1/2}(x)$.

(e) Find the Laplace transform of $\left[\int_0^t\int_0^t \sin u \, du du\right]$.

(f) Find the inverse Laplace transform of $\frac{e^{-\pi s}}{s^2+1}$.

(g) Solve : $(D-5D'+4)^3 z=0$

(h) Write Dirichlets conditions.

(i) Classify the equation $u_{xx}+3u_{xy}+u_{yy}=0$.

(j) Find the steady state temperature distribution in a rod of 2m whose ends are kept at 30°C and 70°C respectively.

SECTION B

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

(a) Solve the simultaneous equations

$$\frac{dx}{dt}+5x-2y=t,\ \frac{dy}{dt}+2x+y=0$$

being given $x=0$, $y=0$ when $t=0$.

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

(c) Use convolution theorem to find the inverse Laplace transform of $\frac{1}{\left(s^2+a^2\right)^2}$.

(d) Expand $f(x)=x\sin x$ as a Fourier series in $0<x<2\pi$.

(e) Find the temperature distribution in a rod of length 'a' which is perfectly insulated including the ends and the initial temperature distribution is $x(a-x), 0<x<a$.

SECTION C

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

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

(b) Solve : $x^2\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}+y=(\log x)\sin(\log x)$

(c) Solve by changing the independent variable :

$$\frac{d^2y}{dx^2}+(3\sin x-\cot x)\frac{dy}{dx}+2y\sin^2 x=e^{-\cos x}\sin^2 x$$

4 (a) Show that $J_{-n}(x)=(-1)^n J_n(x)$

(b) Show the following differential equation in terms of Bessel's function

$$y''+\frac{y'}{x}+\left(1-\frac{1}{9x^2}\right)y=0$$

(c) Express $2x^3+2x^2-x-3$ in terms of Legendre's polynomial.

5 (a) Express the function $f(t)=\begin{cases} t-1 & , 1<t<2 \\ 3-t & , 2<t<3 \end{cases}$ in terms of unit step function, hence find its Laplace transform.

(b) Evaluate $\displaystyle\int_0^\infty \frac{e^{-3t}\sin t}{t}\,dt$.

(c) Find the function $f(t)$ whose Laplace transform is $\log\left(1+\frac{1}{s^2}\right)$.

6 (a) Find the half range sine expansion of

$$f(t)=\begin{cases} t & , 0<t<2 \\ 4-t & , 2<t<4 \end{cases}$$

(b) Solve : $py+qx=xyz^2\left(x^2-y^2\right)$

(c) Solve : $r+s-2t=\sqrt{2x+y}$

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

$$x\frac{\partial^2 u}{\partial x \partial y}+2yu=0$$

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

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

$u(x,0)=0,\quad u(x,1)=0,\quad u(\infty,y)=0$ and $u(0,y)=u_0$.