Section D

7. (a) Expand $f(x)=|\cos x|$ as a Fourier series in the interval $-\pi < x < \pi$. **7.5**

(b) Obtain a Fourier series for the function : **7.5**

$$f(x)=\begin{cases}\pi x & 0 \le x \le 1\\ \pi(2-x) & 1 \le x \le 2\end{cases}$$

8. (a) Solve : **7.5**

$$\left(D^3-7DD'^2-6D'^3\right)z=\sin(x+2y)+e^{2x+y}$$

(b) Solve : **7.5**

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial x \partial y}-6\frac{\partial^2 z}{\partial y^2}=y\cos x$$

9. (a) Find the Integrating factor of the differential equation :

$$ydx-xdy+3x^2y^2e^{x^3}dx=0$$

(b) Prove that :

$$\frac{1}{D-a}X=e^{ax}\int Xe^{-ax}dx$$

MAR-21-210014

B. Tech. EXAMINATION, March 2021

Semester II (CBCS)

ENGINEERING MATHEMATICS—II

MA-202

Time : 2 Hours *Maximum Marks : 60*

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks.

Section A

1. (a) Solve the differential equation : **7.5**

$$\left(2x^2y^2+y\right)dx+\left(3x-x^3y\right)dy=0$$

(b) Solve : **7.5**

$$\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$$

2. (a) Solve : **7.5**

$$(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$$

(b) Solve by the method of variation of parameters :

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$$ **7.5**

Section B

3. (a) Solve by power series method the initial value problem : **7.5**

$$xy'' + y' + 2y = 0 \text{ with } y(1) = 2,\ y'(1) = 4$$

(b) Find the general solution using Frobenius method of : **7.5**

$$8x^2y'' + 10xy' - (1+x)y = 0$$

4. (a) Prove that : **7.5**

$$P_n'(x) = xP_{n-1}'(x) + nP_{n-1}(x)$$

(b) Solve the differential equation in terms of Bessel functions : **7.5**

$$y'' - \frac{2}{x}y' + 4\left(x^2 - \frac{1}{x^2}\right)y = 0$$

Section C

5. (a) Find the Laplace transform of $te^{-4t}\sin 3t$. **7.5**

(b) Find the inverse Laplace transform of

$$\frac{s^2+s}{(s^2+1)(s^2+2s+2)}.$$ **7.5**

6. (a) Apply convolution theorem to evaluate

$$L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}.$$ **7.5**

(b) Solve the differential equation by Laplace transform method : **7.5**

$$\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0,$$

where $y = 1$, $\frac{dy}{dt} = 2$, $\frac{d^2y}{dt^2} = 2$ at $t = 0$.

(c) If $L\left\{2\sqrt{\frac{t}{\pi}}\right\} = \frac{1}{s^{3/2}}$, show that :

$$L\left\{\frac{1}{\sqrt{\pi t}}\right\} = \frac{1}{\sqrt{s}}$$

(d) If $L\{f(t)\} = F(s)$, then show that :

$$L\left\{\frac{1}{t}f(t)\right\} = \int_s^\infty F(s)\,ds$$

(e) Show that :

$$J_2 = J_0'' - x^{-1}J_0'$$

(f) Show that :

$$P_{2n+1}(0) = 0$$

(g) Form partial differential equation from :

$$z = ax + a^2y^2 + b$$

(h) Solve :

$$\left(D^3 - 4D^2D' + 4DD'^2\right)z = 0$$

(i) Define half range cosine series and half range sine series.

(j) Find a_0, where $f(x) = \pi x, -c < x < c$.

10×1.5=15

(c) If $L\left\{2\sqrt{\frac{t}{\pi}}\right\} = \frac{1}{s^{3/2}}$, show that :

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