(b) Obtain a half cosine series for the function :

$$f(x)=\begin{cases} kx & 0 \le x \le l/2 \\ k(l-x) & l/2 \le x \le l \end{cases}$$ **7.5**

8. (a) Solve $\dfrac{\partial^2 z}{\partial x^2} - \dfrac{\partial^2 z}{\partial x \partial y} = \sin x \cos 2y$. **7.5**

(b) Solve $r - 4s + 4t = e^{2x+y}$. **7.5**

(Compulsory Question)

9. (a) Find the Integrating factor of the differential equation $(y \log y - 2xy)dx + (x+y)dy = 0$.

(b) Prove that $\dfrac{1}{f(\mathrm{D})}\mathrm{X}$ is the particular integral of $f(\mathrm{D})y = \mathrm{X}$.

(c) Prove that $\mathrm{L}\{\cos at\} = \dfrac{s}{s^2+a^2}$, $s > 0$.

(d) If $\mathrm{L}\left\{\dfrac{1-\cos at}{a^2}\right\} = \dfrac{1}{s\left(s^2+a^2\right)}$, then show that :

$$\mathrm{L}\left\{\frac{t(1-\cos at)}{a^2}\right\} = \frac{3s^2+a^2}{s^2\left(s^2+a^2\right)^2}.$$

Roll No. .... **Total Pages : 05**

Sep-21-00014

B. Tech. EXAMINATION, 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 any of the Sections A, B, C and D. Q. No. **9** is compulsory.

Section A

1. (a) Solve the differential equation :

$$\left(xy^2 - e^{\frac{1}{x^3}}\right)dx - x^2 y\,dy = 0.$$ **7.5**

(b) Solve $\frac{d^4y}{dx^4} - y = \cos x \cosh x$. **7.5**

2. (a) Solve $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = x^2 \log x$. **7.5**

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

$$\frac{d^2y}{dx^2} + 4y = 4\sec^2 2x.$$ **7.5**

Section B

3. (a) Find a power series solution in powers of x of the differential equation :

$$x(x+1)y' - (2x+1)y = 0.$$ **7.5**

(b) Using method of Frobenius, obtain the series solution in power of x for :

$$x(1+x)y'' + (x+5)y' - 4y = 0.$$ **7.5**

4. (a) Prove that $J_1''(x) = -J_1(x) + \frac{1}{x}J_2(x)$. **7.5**

(b) Prove that $\int_{-1}^{1} P_m(x)P_n(x)dx = 0$ if $m \neq n$. **7.5**

Section C

5. (a) Find the Laplace transform of $e^{4t}\sin 2t \cos t$. **7.5**

(b) Find the inverse Laplace transform of :

$$\frac{5s+3}{(s-1)(s^2+2s+5)}.$$ **7.5**

6. (a) Using Laplace transform, evaluate the integral

$$\int_0^\infty \frac{\cos 6t - \cos 4t}{t} dt.$$ **7.5**

(b) Solve the differential equation using Laplace transform method $\frac{d^2x}{dt^2} + 9x = \cos 2t$ given

$$x(0) = 1,\ x\left(\frac{\pi}{2}\right) = -1.$$ **7.5**

Section D

7. (a) Expand the function $f(x) = x\sin x$ as a Fourier series in the interval $-\pi \leq x \leq \pi$. **7.5**

(e) Show that $J_0'' = \frac{1}{2}(J_2 - J_0)$.

(f) Show that $P_n(-x) = (-1)^n P_n(x)$.

(g) Form partial differential equation from $z = ax + by + ab$.

(h) Solve $(2D^2 + 5DD' + 2D'^2)z = 0$.

(i) Write the sufficient conditions for the convergence of the Fourier series.

(j) Find a_0, where $f(x) = x - x^2$, $-1 < x < 1$.

1.5×10=15

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