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**BIJSC**  
**(SEM II) THEORY EXAMINATION 2021-22**  
**ENGINEERING MATHS-II**

Time: 3 Hours

Total Marks: 70

Note: Attempt all Sections. If require any missing data, then choose suitably.

**SECTION A**

1. Attempt all questions in brief.

2\*7 = 14

|    |   |
|----|---|
| a. | Calculate order and degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2} = k \frac{dy}{dx}$ . |
| b. | Find particular integral of $(D - 2)^2 y = 6e^{2x}$ .   |
| c. | Prove that $f_{xy}(x) = -f_{yx}(x)$ .   |
| d. | Evaluate $\int_0^1 x^2 P_2(x) dx$ .   |
| e. | Find the Laplace transform of $f(t) = e^{t^2 - 1}$ .  |
| f. | Find the function whose Laplace transform is $\frac{2}{s^2 + 2}$ .  |
| g. | Find the Fourier constant $a_n$ for $f(x) = x \sin x$ in the interval $(-a, a)$ .   |

**SECTION B**

2. Attempt any three of the following.

3\*3 = 9

|    |  |
|----|--|
| a. | Solve by changing independent variable the differential equation $(1+x)^2 \frac{dy}{dx} - (1+x) \frac{d^2y}{dx^2} + y = 4 \cos \log(1+x)$ .  |
| b. | Use Frobenius method to find the series solution of $2x(1-x) \frac{d^2y}{dx^2} + (5-7x) \frac{dy}{dx} - 3y = 0$ .  |
| c. | State Convolution Theorem and hence evaluate $\int_0^1 (1-x) \cos(x) dx$ .   |
| d. | Obtain Fourier series for $f(x) = \begin{cases} \pi x & -\pi \leq x \leq 1 \\ x(2-x) & 1 \leq x \leq 2 \end{cases}$ .  |
| e. | If a string of length $l$ is initially at rest in equilibrium position and each of its point is given the velocity $\left(\frac{\partial y}{\partial t}\right)_{t=0} = k \sin^2 \frac{\pi x}{l}$ , find the displacement $y(x, t)$ . |

**SECTION C**

3. Attempt any one part of the following.

3\*1 = 3

|    |  |
|----|--|
| a. | Solve the following simultaneous differential equations $\frac{dx}{dt} = 3x + 2y, \frac{dy}{dt} = 5x + 3y$ |
| b. | Solve the differential equation $\frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = \frac{1-x}{x^2}$                |