

(i) Printed Pages : 2 Roll No.

(ii) Questions : 8

Sub. Code :

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Exam. Code :

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B.A./B.Sc. (General) 4th Semester
(2053)

MATHEMATICS

Paper : II Differential Equations-II

Time Allowed : Three Hours] [Maximum Marks : 30

Note :—(i) Attempt FIVE questions in all, selecting at least TWO questions from each Section.

(ii) All questions carry equal marks.

SECTION—A

1. Solve $2x \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} - 2y = 0$ in powers of x . 6

2. (a) Prove that $\frac{d}{dx} \{x^n J_n(x)\} = x^n J_{n-1}(x)$.

(b) Prove that $J_{-\frac{3}{2}}(x) = -\sqrt{\frac{2}{\pi x}} \left(\frac{\cos x}{x} + \sin x \right)$. 3,3

3. State and prove orthogonal property of Legendre's Polynomials. 6
4. (a) Find partial differential equation of planes having equal x and y intercepts.

(b) Solve the equation $xzp + yzq = xy$. 3,3

SECTION—B

5. (a) Find $L(\sin \sqrt{t})$.

(b) Show that $L\left(\frac{\cos at - \cos bt}{t}\right) = \frac{1}{2} \log\left(\frac{s^2 + b^2}{s^2 + a^2}\right)$. 3,3

6. (a) Evaluate $L^{-1}\left(\frac{e^{-4s}}{(s-2)^4}\right)$.

(b) State and prove Convolution Theorem. 3,3

7. Solve the equation

$$\frac{d^2y}{dt^2} + t \frac{dy}{dt} - y = 0, \quad y = 0, \quad \frac{dy}{dt} = 1, \quad \text{when } t = 0. \quad 6$$

8. (a) Prove that $\left(\int_0^\infty t^3 e^{-t} \sin t \, dt\right) = 0$.

(b) Evaluate $L^{-1}\left(\tan^{-1} \frac{2}{s^2}\right)$. 3,3