

(i) Printed Pages : 2

Roll No.

(ii) Questions : 8

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

1046

MATHEMATICS

Paper-II : Differential Equations - II

Time Allowed : Three Hours]

[Maximum Marks : 30

Note : Attempt five questions in all by selecting at least two from each Unit.

UNIT-I

I. (a) Solve $y'' + x^2y = 1 + x + x^2$ in powers of x . 3

(b) Solve in series : $xy'' - (4+x)y' + 2y = 0$. 3

II. (a) Prove that $\frac{d}{dx}(J_n(x)) = \frac{-n}{x} J_n(x) + J_{n-1}(x)$. 3

(b) Prove that $\cos(x \sin \phi) = J_0(x) + 2 \cos 2\phi J_2(x) + \dots$ 3

III. (a) Express $5x^2 - 3x + 6$ in terms of Legendre's polynomial. 3

(b) Show that $(1 - 2kx + k^2)^{-1/2} = \sum_{n=0}^{\infty} K^n \cdot P_n(x)$,

where $|x| \leq 1, |k| < 1$. 3

IV. (a) Solve the Lagrange's linear equation $xzp + yzq = xy$ for general solution. 3

(b) Find equation of integral surface of

$$(y - z) p + (z - x) q = x - y, \text{ which passes through } y = 2x, z = 0. \quad 3$$

UNIT-II

V. (a) State & prove Linear property of Laplace transform. 1+2

(b) Evaluate $L\left(\frac{1 - \cos t}{t^2}\right)$. 3

VI. (a) Evaluate $L^{-1}\left(\frac{1}{(S-1)^5 (S+2)}\right)$. 3

(b) State Convolution Theorem and use it to evaluate

$$L^{-1}\left(\frac{S}{(S^2 + 9)^2}\right). \quad 1+2$$

VII. Solve $\frac{d^2 x}{dt^2} + \alpha^2 x = g(t)$ where $x(0) = \ell$ and $x'(0) = m$ and

hence solve $\frac{d^2 x}{dt^2} + 9x = 39e^t$ where $x(0)x'(0) = 1..$ 4+2

VIII. (a) Evaluate $\int_0^{\infty} \frac{\sin t}{t} dt$ by using Laplace transform.

(b) Evaluate $L^{-1}\left\{\log \frac{S+4}{S+5}\right\}$ 3