(i) Printed Pages: 2   Roll No. ....

(ii) Questions : 8   Sub. Code : | 0 | 3 | 4 | 2 |
                              Exam. Code : | 0 | 0 | 0 | 4 |

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

1059

MATHEMATICS

Paper-II (Differential Equations-II)

Time Allowed : Three Hours]   **[Maximum Marks : 30**

Note :— Attempt **five** questions in all, selecting at least **two** questions from each unit.

UNIT—I

1. Solve :

    $y'' + (x - 1)^2 y' - 4(x - 1)y = 0$, about $x = 1$.   6

2. (a) Show that $e^{\frac{x}{2}\left(u - \frac{1}{u}\right)}$ is generating function for Bessel function.   3

    (b) Show that :

    $$\cos(x \cos\phi) = J_0(x) - 2 \cos2\phi \ J_1(x) + \ ....$$ 3

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

    (b) Show that :

    $$\int_{-1}^{1} (P_n(x))^2 \ dx = \frac{2}{2n+1}.$$ 3

4. (a) If z = y f(x) + x g(y), form partial differential equation by eliminating f and g. 3

   (b) Find general solution of yzp + zxq = x. 3

UNIT—II

5. State and prove convolution theorem. 6

6. (a) Evaluate :

$$\int_0^\infty \sin x^2 \, dx .$$ 3

   (b) Use 2nd shifting theorem to find L(g(t)), where :

$$g(t) = \begin{cases} 0, & 0 < t < \dfrac{1}{2} \\ t + \dfrac{3}{2}, & t > \dfrac{1}{2} \end{cases}$$ 3

7. (a) Solve $y(t) = 1 + \int_0^t y(u) \sin(t-u) \, du$ cutting verified. 3

   (b) Solve :

$$\frac{d^2y}{dt^2} + t\frac{dy}{dt} - y = 0, \ y(0) = 0, \ y'(0) = 2.$$ 3

8. (a) Evaluate :

$$L^{-1}\left(\log\frac{s+1}{s+7}\right).$$ 3

   (b) Prove :

$$\int_0^\infty \frac{\sin t}{t} \, dt = \frac{\pi}{2}.$$ 3