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

(ii) Questions : 8 Sub. Code : 0342

Exam. Code : 0004

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

(2042)

MATHEMATICS

Paper : II (Differential Equations–II)

Time Allowed : Three Hours] [Maximum Marks : 30

Note :—Attempt **FIVE** questions in all, by selecting at least **TWO** questions from each unit.

UNIT—I

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

2. (a) Show that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\sin x$. 3

(b) Show that $\sin x = 2J_1(x) - 2J_3(x) + ...$ 3

3. (a) Express $3x^2 + 7x + 1$ in terms of Legendre polynomial. 3

(b) Show that $\int_{-1}^{1} P_m(x)\,P_n(x)dx = 0$, if $m \neq n$. 3

4. (a) Solve $x^2p + y^2q = z^2$. 3

(b) Form differential equation by eliminating f from $f\left(\frac{x}{z}, \frac{y}{z}\right) = 0$. 3

UNIT—II

5. (a) Find $L\left(\sin\sqrt{t}\right)$. 3

(b) Evaluate $\int_0^\infty e^{-3t} . t . \sin t \, dt$. 3

6. (a) Using convolutes find $L^{-1}\left(\frac{1}{S(S+7)}\right)$. 3

(b) Find $L^{-1}\left(\log\left(\frac{S+1}{S+9}\right)\right)$. 3

7. Solve $\frac{d^2y}{dt^2} + \frac{dy}{dt} = 2$ where $y(0) = 3$, $y'(0) = 1$. 6

8. (a) State and prove first shifting theorem of Laplace transformation. 3

(b) Find $L^{-1}\left(\frac{3}{S^2+1} - \frac{1}{S+3}\right)$. 3