

[ 4 ]

- c) i) State and prove first shifting theorem. 4  
ii) Find the Inverse transform of 4

$$\frac{P+2}{P(P^2+2P+2)}$$

- d) Find the Laplace Transform of the function

$$f(t) = 3 \sin 3t - 2 \cos 3t + t^2$$

L-595-700

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2019

Full Marks - 60

Time - 3 hours

The figures in the right-hand margin indicate marks

Answer *all* questions

1. a) Define Linear differential equation and find the general solution of  $y^2 dx + (3xy - 1) dy = 0$  6

- b) i) Solve :  $y = 2p + 3p^2$  4  
ii) Define Integrating factor. 2

OR

- c) i) Define Riccati equation. 2  
ii) Solve the differential equation. 6

$$(2x - 3y + 5) dy + (x - 2y + 3) dx = 0$$

- d) Solve  $y = (1 + p)x + p^2$  4

L-595

[Turn Over

2. a) Solve the following initial value problem 6

$$y''' - 3y'' + 3y' - y = 0, \quad y(0) = 1, \quad y'(0) = 0, \quad y''(0) = 0$$

- b) Solve by method of undetermined co-efficients. 6

$$y'' + 2y' - 35y = 12e^{5x} + 37 \sin 5x$$

OR

- c) Find the particular integral of 4

$$\frac{d^2y}{dx^2} + y = x \sin x$$

- d) Solve by variation of parameter Method 8

$$y'' - 2y' + y = \frac{e^x}{x^3}$$

3. a) Solve  $xy'' - 2y' + \frac{2y}{x} = x^2 \log x$  8

- b) Solve  $xy'' + 2y' = 0$  4

OR

- c) Solve:  $(x^2D^2 + xD - 9)y = 48x^5$  8

- d) Solve:  $x^2y'' - 3.5xy' - 2.0y = 0$  4

4. a) Find the power series solution 6

$$\text{of } y'' + 4y = 0$$

- b) If  $P_n$  is a polynomial of degree  $n$ , then prove

$$\text{that } \int_{-1}^1 P_m(x) P_n(x) dx = 0 \text{ if } m \neq n \quad 6$$

OR

- c) Find the power series solution of 6

$$(1 - x^2)y'' - 2xy' + 2y = 0$$

- d) Prove that :  $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$  6

- 5 a) Solve the following initial value problem using  
laplace transform 8

$$y'' + ay' - 2a^2y = 0, \quad y(0) = 6, \quad y'(0) = 0$$

- b) Find the laplace transform of 4

$$te^{-t} \sin 3t.$$

OR