Q. P. Code: 20945

(Time: 2½ hours)

Total Marks: 75

- N. B.: (1) All questions are compulsory.
 - (2) Make <u>suitable assumptions</u> wherever necessary and <u>state the assumptions</u> made.
 - (3) Answers to the same question must be written together.
 - (4) Numbers to the right indicate marks.
 - (5) Draw neat labeled diagrams wherever necessary.
 - (6) Use of Non-programmable calculators is allowed.
 - 1. Attempt <u>any three</u> of the following:

15

a. Find the Adjoint of the given matrix and hence find Inverse if exist

$$\begin{bmatrix} 2 & -1 & 3 \\ 4 & 6 & -2 \\ 5 & 1 & 8 \end{bmatrix}$$

b. Find the Characteristic values and characteristic vectors of the given matrix.

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

c. Verify Caley-Hamilton theorem for the given matrix, also find inverse if exists.

$$\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$

- d. Expand $(1 + \cos x + i\sin x)^n$
- e. Evaluate $(1 + i\sqrt{3})^{16} / (\sqrt{3} i)^{17}$
- f. Express sec (x + iy) in a + ib form
- 2. Attempt any three of the following:

15

- a. Solve the Differential Equation $(x 4xy 2y^2) dx + (y^2 4xy 2x^2) dy = 0$
- b. Solve the Differential Equation $dy/dx + x^2y = x^5$
- c. Solve the following Equation $x^2p^2 2xpy + (2y^2 x^2) = 0$
- d. Solve the following Equation p (p + y) = x (x + y)
- e. Find the Complementary and Particular Solution of the equation $(D^3 + D^2 + D + 1)y = \sin 2x$
- f. Find the General Solution of the equation $(D^2 + 4)y = \sin 3x + e^x + x^2$
- 3. Attempt any three of the following:

15

- Evaluate $\int_0^\infty e^{-2t} \sin^2 t \, dt$
- b. Find the inverse Laplace transform for the function

$$F(s) = \frac{21-s^2}{s(s^2+4s+13)}$$

c. Find Laplace transformation of the function

$$f(t) = te^{2t} \cos 3t$$

[TURN OVER]

Q. P. Code: 20945

d. Obtain the Inverse Laplace transform of each of the given function

$$\frac{(s+1)}{s^3(s-3)^2}$$

e. Find Inverse Laplace Transformation by convolution theorem for

$$F(s) = \frac{s}{(s^2 + 1)(s^2 + 4)}$$

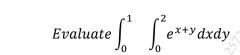
f. By using fundamental definition, find laplace transform of f(t)

$$F(t) = t, 0 < t < 4$$

= 5, t > 4

4. Attempt any three of the following:

a.



- b. $Evaluate \int_0^3 \int_0^{\sqrt{4-y}} \frac{dxdy}{(1+x^2+y^2)}$
- c. $Evaluate \int_0^{log 2} \int_0^x \int_0^{x+log y} e^{x+y+z} dx dy dz$
- d. Evaluate $\int_{0}^{1} \int_{0}^{1-x} \int_{0}^{x+y} e^{z} dxdydz$
- e. Change the order of integration and evaluate $\int_0^2 \int_0^{x^2/4} xy dx dy$
- f. Solve $\iint r^3 dr d\theta$ over the area included between the circles ${\bf r}$ = $2\sin\theta$ and ${\bf r}$ = $4\sin\theta$
- 5. Attempt any three of the following:

a. Evaluate $\int_0^{\pi/2} sin^6 x \cos^7 x \ dx$

- b. Evaluate i) erfc(-x) + erfc(x)ii) erfc(x) + erf(x)
- c. Evaluate $\int_0^{2a} x(2ax x^2)^{1/2} dx$

[TURN OVER]

15

Q. P. Code: 20945

- d. Evaluate $\int_0^{\pi/2} \sin^5 2x dx$
- e. Evaluate $\int_0^1 \frac{x^7}{(1-x^4)^{1/2}} dx$
- f. Evaluate $\int_0^1 \frac{(x^a x^b)}{\log x} dx$