

FACULTY OF ENGINEERING

B.E. II-Semester (AICTE) (Main & Backlog) Examination, November 2020

Subject : Mathematics - II

Time : 2 Hours

Max. Marks: 70

Note: Answer Any five Questions from Part-A & Any Four Questions From Part-B.

PART - A (5x4=20 Marks)

- 1 Examine whether the vector (1, 2, 1), (3, 4), (3, 7) are linearly independent.
- 2 If 1, -1, 2 are the eigen values of a 3 x 3 matrix A, find the determinant of the matrix $A^3 - 2A^{-1} + I$.
- 3 Define exact differential equation.
- 4 Find the singular solution of the Clairant's equation $y + xy' = 1 + y'^2$.
- 5 Find the complementary function of $(D^2 + D + 1)^2 y = e^{-x} \tan x$.
- 6 Solve $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0$.
- 7 Evaluate $\Gamma\left(-\frac{3}{2}\right)$.
- 8 State Rodrigue's formula and hence find $P_2(x)$.
- 9 Find $L\{e^{-t} \sin t \cos t\}$
- 10 Evaluate $\int_0^{\infty} \frac{\sin t}{t} dt$ using Laplace transform.

PART - B (4x15=60 Marks)

- 11 (a) Test for consistency and hence solve the following system of equations.

$$x_1 + 2x_2 + x_3 = 2, \quad 3x_1 + x_2 - 2x_3 = 1, \quad 4x_1 - 3x_2 - x_3 = 3, \quad 2x_1 + 4x_2 + 2x_3 = 4$$

- (b) Find the characteristics equation of $A = \begin{pmatrix} 4 & 3 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & 1 \end{pmatrix}$ and hence find A^{-1} .

- 12 (a) Solve $(3x^2 y^4 + 2xy) dx + (2x^3 y^3 - x^2) dy = 0$.

- (b) Find the orthogonal trajectories of the family of parabolas $y^2 = 2cx + c^2$.

- 13 (a) Find the general solution of the differential equation

$$\frac{d^3 y}{dx^3} - y = (e^x + 1)^2.$$

- (b) Solve $y'' + 2y' + 2y = e^x \cos x$ by the method of variation of parameters.

- 14 (a) Evaluate $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$ using Beta and Gamma functions.

- (b) Show that $P_{2n}(0) = (-1)^n \frac{1.3.5 \dots (2n-1)}{2.4.6 \dots 2n}$ and $P_{2n+1}(0) = 0$.

15 (a) Find the inverse Laplace transform of $\lg \left(\frac{s+a}{s+b} \right)$.

(b) Apply Laplace transforms to solve $y' + y = 3\cos 2x$, $y(0) = 0 = y'(0)$.

16 Reduce the quadratic form $Q = 2(xy + yz + zx)$ to Canonical form using orthogonal transformation.

17 (a) Show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.

(b) Apply convolution theorem to find $L^{-1}\left\{\frac{s}{(s^2+1)(s-1)}\right\}$

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