

FACULTY OF ENGINEERING
B.E. II - Semester (AICTE) (Backlog) Examination, March / April 2022

Subject: Mathematics – II
(Common for All Branches)

Max. Marks: 70

Time: 3 Hours

(Missing data, if any, may be suitably assumed)

PART – A

(10 x 2 = 20 Marks)

Note: Answer all questions.

1. Define rank of the matrix and find the rank of the matrix $A = \begin{bmatrix} 2 & 6 \\ 1 & 3 \end{bmatrix}$
2. Let $V_1 = (1, -1, 0)$, $V_2 = (0, 1, -1)$ and $V_3 = (0, 0, 1)$ be elements of R^3 . Show that the set of vectors $\{V_1, V_2, V_3\}$ is linearly independent.
3. Define exact differential equation.
4. Obtain the singular solution of the equation $y = xy' + (y')^2$.
5. Find a differential equation of the form $ay'' + by' + cy = 0$, for which the function $1, e^{-2x}$ are solutions.
6. Define Cauchy- Euler equation.
7. Express the sums of Legendre polynomial $8P_4(x) + 2P_2(x) + P_0(x)$ in terms of powers of x .
8. Show that $\Gamma(-1/2) = -2\sqrt{\pi}$.
9. Find the Laplace transform of the function $t \sin 4t$.
10. Define convolution theorem in Laplace transform.

PART – B

(5 x 10 = 50 Marks)

Note: Answer any five questions.

11. (a) Investigate the values of λ and μ so that the equations $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + \lambda z = \mu$, have (i) no solution (ii) a unique solution and (iii) an infinite number of solutions.
(b) Reduce the quadratic form $2xy + 2yz + 2zx$ into canonical form.
12. (a) Solve the initial value problem $e^x (\cos y \, dx - \sin y \, dy) = 0$, $y(0) = 0$.
(b) Solve the differential equation $\frac{dy}{dx} - y = y^2 (\sin x + \cos x)$.
13. (a) Solve $(D^2 + 3D + 2)y = xe^x \sin x$.
(b) It is known that e^{-2x} is a solution of the differential equation $y'' - y' - 6y = 0$. Find the second linearly independent solution and write the general solution.