FACULTY OF ENGINEERING
B.E. II - Semester (AICTE) (Main) Examination, October 2021

Subject: Mathematics - II

Time: 2 Hours

Max. Marks: 70

Note: i) First Question is compulsory and answer any three questions from the remaining six questions.

ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.

iii) Missing data, if any, may suitably be assumed.

Answer any four questions from the following.   (4x4=16 Marks)

1. a Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 4 \\ 1 & 3 & -1 \\ 8 & 13 & 14 \end{bmatrix}$.

b Solve $y(2xy + e^x)dx = e^x dy$.

c Solve $(D^2 + 9)y = \sin 3x$.

d Evaluate $\int_0^\infty e^{-5x}(1 - e^{-x})^2 dx$ in terms of beta function.

e Find $L\{t^3 e^t + \sin^2 t\}$.

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

g Evaluate $6P_3(x) + 4P_2(x) - 16P_1(x)$ as a polynomial of x.

(3x18=54 Marks)

2. (a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{bmatrix}$.

(b) Reduce the quadratic form $8x_1^2 + 7x_2^2 + 3x_3^2 + 12x_1x_2 + 4x_1x_3 - 8x_2x_3$ into canonical form.

3. (a) Solve $y(x + y)dx - x^2 dy = 0$.
(b) Solve $y(2xy + 1)dx + x(1 + 2xy - x^3 y^3)dy = 0$.

4. (a) Solve $y'' + 4y = x\cos x$.
(b) Solve $y'' + 2y' + y = e^{-x} \log x$ by the method of variation of parameters.

5. (a) Find the power series solution of the differential equation $y'' + 2xy' + y = 0$ about the origin.

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(b) Evaluate $\dfrac{d}{dx}[erf(\alpha x)]$.

6 (a) Find $L\left\{\displaystyle\int_0^t ue^{-u}\sin 4u\ du\right\}$.

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

7 (a) Find the orthogonal trajectories of the family of curves $y^3+3x^2y=c$ where c is arbitrary constant.

(b) Solve $x^2y''-xy'-3y=x^2\log x$.

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