

JECRC UNIVERSITY
School of Engineering
2nd In Term Examination -2021-22
B.Tech.- II Semester (Common to all)
Subject: Engineering Mathematics II (DMA002A)

Max. Marks: 50

Time: 1:30 hrs.

Instructions:

1. Attempt all the questions.
2. Illustrate your answers with suitable examples and diagrams, wherever necessary.
3. Write the relevant question number before writing the answer.

Part A (1X10=10)

- A1.(CO3) The differential equation: $(5x + y - 5)dx + (3x + 2y + 2)dy$ is exact. (True/False)
- A2.(CO3) Find the particular integral of $(D^2 + 4)y = \sin 3x$.
- A3.(CO4) If $1 + P + Q = 0$, then $u = \dots$
 (a) e^x (b) e^{-x} (iii) x (iv) None of these.
- A4.(CO4) If $P + Qx = 0$, then $u = \dots$
- A5.(CO3) Condition of exactness in the first order linear differential equation is
- A6.(CO3) C.F. of the equation $(D^3 - 3D^2 + 2D)y = 12(x^2 - 2x + 4)$ is
- A7.(CO4) Write the standard form of differential equation for second order differential equation with variable coefficient.
- A8.(CO3) General formula for $\frac{1}{D-\alpha} Q = \dots$
- A9.(CO3) How we can identify the homogeneous differential equation first order.
- A10.(CO3) Every linear differential equation is also known as Bernoulli's equation. (T/F)

Part B (2X4)=8

- B1.(CO4) Show that the equation $x^2 \frac{d^2 y}{dx^2} + 3x \frac{dy}{dx} + y = \frac{1}{(1-x)^2}$ is exact.
- B2.(CO4) Calculate the value of I in the following equation using normal form method.

$$4x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + (x^3 + 6x^4 + 4)y = 0$$

B3.(CO3) Solve: $(D^2 + 5D + 6)y = e^{2x}$

B4.(CO3) Solve: $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

Part C (6X2)=12

C1.(CO3) Solve $\frac{d^2 y}{dx^2} + \frac{dy}{dx} - 2y = x + \sin x$.

C2.(CO3) Solve $(1+x^2) \frac{dy}{dx} + 2xy = \cos x$.

Part D (10X2)=20

D1.(CO4) Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 \log x$.

D2.(CO3) Solve $(1+e^{xy})dx + e^{xy} \left(1 - \frac{x}{y}\right) dy = 0$.

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JECRC UNIVERSITY
School of Engineering
End Term Examination -2021-22
B.Tech.- II Semester (Common to all)
Subject: Engineering Mathematics II (DMA002A)

Time: 3 hrs.
Instructions:

Max. Marks: 100

1. Attempt all the questions in sequence.
2. Illustrate your answers with suitable examples and diagrams, wherever necessary.
3. Write the relevant question number before writing the answer.

Part A (1X10=10)

- A1.(CO1) Matrices A and A^T have the same Eigen values. (True/False) True
 A2.(CO1) Product of Eigen value is equal to the value of determinant
 A3.(CO2) If the limit of the sequence is finite, then it is
 (i) convergent (ii) divergent (iii) both a and b (iv) None of these.
 A4.(CO2) The nature of infinite series is change if we remove finite number of terms from series. (T/F) False
 A5.(CO3) Standard form of linear differential equation is $\frac{dy}{dx} + Py = Q$
 A6.(CO3) Degree of the homogeneous equation $x^2 y'' - (x^2 + y^2) dy = 0$ is 2
 A7.(CO4) Second order differential equation with constant coefficient cannot be solve using method of variation of parameter. (T/F) False
 A8.(CO4) If $2 + 2Px + Qx^2 = 0$ then one part of C.F. is 2
 A9.(CO5) If $P_0 \neq 0$ at $x = 0$ then $x = 0$ is called irregular singular point. (T/F) True
 A10.(CO5) Lagrange's auxiliary equation is defined as $xy' + yz' = zx$

Part B (2X5)=10

B1.(CO1) Find the rank of matrix

$$\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$$

B2.(CO2) Test the convergence of the following series.

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$$

B3.(CO3) Solve $(x+y)^2 \frac{dy}{dx} = a^2$.

B4.(CO4) Calculate the value of I (reduction to normal form) for the following differential equation

$$\frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + (4x^2 - 1)y = -3e^x \sin 2x$$

B5.(CO5) Define regular singular point.

Part C (6X5)=30

C1.(CO1) For what value of k the equations $x + y + z = 1, 2x + y + 4z = k, 4x + y + 10z = k^2$ have a solution and solve them completely in each case.

C2.(CO2) Test the convergence of the following series.

$$\frac{1}{\sqrt{1} + \sqrt{2}} + \frac{1}{\sqrt{2} + \sqrt{3}} + \frac{1}{\sqrt{3} + \sqrt{4}} + \dots$$

$$\frac{1}{\sqrt{n} + \sqrt{n+1}}$$

C3.(CO3) Solve $(xy^2 \sin xy + y \cos xy) dx + (x^2 y \sin xy - x \cos xy) dy = 0$.

C4.(CO4) Solve $\frac{d^2 y}{dx^2} + \frac{1}{x} \frac{dy}{dx} = \frac{12 \log x}{x^2}$.

C5.(CO5) Solve in series $(2-x^2) \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} - 2y = 0$.

Part D (10X5)=50

D1.(CO1) Find the Eigen value and Eigen vector of the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & -6 \\ 2 & -2 & 3 \end{bmatrix}$.

D2.(CO2) Discuss the convergence of the series $\frac{x}{1} + \frac{1}{2} \frac{x^2}{3} + \frac{13}{24} \frac{x^3}{5} + \frac{135}{246} \frac{x^4}{7} + \dots (x > 0)$.

D3.(CO3) Solve $\frac{d^2 y}{dx^2} + a^2 y = \sec ax$.

D4.(CO4) Solve $\frac{d^2 y}{dx^2} + (3 \sin x - \cot x) \frac{dy}{dx} + 2 \sin^2 x y = \sin^2 x e^{-\tan x}$.

D5.(CO5) Solve using Charpit's method $pxy + pq + qy = yz$.

$xy dx - x^2 dy - y^2 dy =$
 $\int \frac{x^2 dy}{y} + \frac{y^2 dy}{x} = \int \frac{1}{y} dy + \frac{y^2}{x} = \log y + \frac{y^2}{x} = 1$
 $\frac{1}{y} \frac{dy}{dx} + \frac{y}{x^2} = 1$
 $\text{order} = 1 \text{ . degree} = 1$