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Printed Page:-4 **Subject Code:- CBT0101**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: I - THEORY EXAMINATION (2025 - 2026)
Subject: Elementary Mathematics

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. The solution region of the following system of inequalities $3x+4y \leq 60$, $x+3y \leq 30$, $x \geq 0$, $y \geq 0$, lies in (CO1,K2) 1

(a) First quadrant
(b) Second quadrant
(c) Third quadrant
(d) None of these

1-b. The solution of $x^2 + 5x + 6 = 0$ is : (CO1,K3) 1

(a) -2, 3
(b) -2, -3
(c) 3, 2
(d) None of these

1-c. If y =x sinx then the value of $\frac{dy}{dx}$ is : (CO2,K3) 1

(a) - x cosx + sinx
(b) x sinx - cosx
(c) x cosx + sinx
(d) None of these

1-d. If $x = t^2$ and $y = t^4$. then $\frac{dy}{dx}$ is : (CO2,K3) 1

(a) $2t^2$
(b) t^2
(c)

.

$\frac{t^2}{2}$

(d) None of these

1-e. The value of $\int_{-\pi}^{\pi} \sin x \, dx$ is : (CO3,K2) 1

(a) 1

(b) 0

(c) 2

(d) None of these

1-f. The value of $\int 2x\cos(x^2) \, dx$ is : (CO3,K2) 1

(a) $2\sin x^2 + c$

(b) $\sin x^2 + c$

(c) $\sin x + c$

(d) $-\sin x^2 + c$

1-g. The Integrating factor of the differential equation $x\frac{dy}{dx} - 2y = 2x^2$ (CO4,K2) 1

(a) logx

(b) $\frac{1}{x^2}$

(c) x

(d) None of these

1-h. Which of the following is a homogeneous differential equation ? (CO4,K1) 1

(a) $(4x + 6y + 5)dy - (3y + 2x + 4)dx = 0$

(b) $(xy)dx - (x^3 + y^3)dy = 0$

(c) $(x^3 + 2y^2)dx + 2xydy = 0$

(d) $y^2dx + (x^2 - xy - y^2)dy = 0.$

1-i. If $|A| = 3$, $A^{-1} = \begin{bmatrix} 3 & -1 \\ \frac{-5}{3} & \frac{2}{3} \end{bmatrix}$, then adjA = ? (CO5,K3) 1

(a) $\begin{bmatrix} 9 & 3 \\ -5 & -2 \end{bmatrix}$

(b) $\begin{bmatrix} 9 & -3 \\ -5 & 2 \end{bmatrix}$

(c) $\begin{bmatrix} -9 & 3 \\ 5 & -2 \end{bmatrix}$

(d) none of these

1-j. If A is a 3 × 2 matrix and B is a 2 × 4 matrix, then the order of AB is (CO5,K2) 1

(a) 2 × 3

(b) 3 × 4

(c) 2 × 2

(d) none of these

2. Attempt all parts:-

2.a. Solve the inequality $\frac{-4(x+2)}{5} > 4-2x$. (CO1,K3) 2

2.b. Evaluate $\lim_{x\to 3} \frac{x^3-27}{x-3}$. (CO2,K3) 2

2.c. Find the integral $\int \frac{x^2+3x+4}{\sqrt{x}}\,dx$. (CO3,K3) 2

2.d. Solve $y^2\frac{dy}{dx} = x$. (CO4,K3) 2

2.e. If $A=\begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}=\begin{bmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{bmatrix}$, then find the value of (a-2b). (CO5,K3) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) Solve the following inequalities graphically : $4x+3y \leq 60$, $y \geq 2x$, $x \geq 3$, $x, y \geq 0$. (CO1,K3) 6

3.a.(ii) A solution is to be kept between 68° F and 77° F. What is the range in temperature in degree Celsius (C) if the Celsius / Fahrenheit (F) conversion formula is given by F=9/5 C+32. (CO1,K3)) 6

3.b. Answer any one of the following:-

3.b.(i) Find local maximum and local minimum values of the function f given by $f(x) = x^3 - x^2 + 9x - 8$. (CO2,K1) 6

3.b.(ii) Show that the function $f(x)=\begin{cases} 2+x & \text{when } x \geq 0 \\ 2-x & \text{when } x < 0 \end{cases}$. is not differentiable at x = 0 . (CO2,K1) 6

3.c. Answer any one of the following:-

3.c.(i) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x+\cos x}\,dx$. (CO3,K3) 6

3.c.(ii) Evaluate $\int \frac{(x-1)}{(x+3)(x+4)}\,dx$. (CO3,K3) 6

3.d. Answer any one of the following:-

3.d.(i) Find the general solution of the differential equation $\frac{dy}{dx} = \frac{x+1}{2-y}$. (CO4,K3) 6

3.d.(ii) Solve $x\frac{dy}{dx} + y = x\log x$. (CO4,K3) 6

3.e. Answer any one of the following:-

3.e.(i) If $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}\begin{bmatrix} 1 & -3 \\ -2 & 4 \end{bmatrix}=\begin{bmatrix} -4 & 6 \\ -9 & x \end{bmatrix}$, find the value of x . (CO5,K3) 6

3.e.(ii) Find the inverse of the given matrix $\begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$. (CO5,K3) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Solve the following system inequalities graphically $5x+4y \leq 20, x \geq 2, y \geq 4$. (CO1,K3) 10

4-b. Solve : $\frac{(x-2)}{(x+5)} > 2$. (CO1,K3) 10

5. Answer any one of the following:-

5-a. Find $\frac{dy}{dx}$, if $x^3+x^2y+xy^2+y^2+y^3=81$. (CO2,K3) 10

5-b. If $y = e^x \sin(\cos x^4)$, find $\frac{dy}{dx}$. (CO2,K3) 10

6. Answer any one of the following:-

6-a. Evaluate $\int \frac{1}{9x^2+6x+5}dx.$ (CO3,K3) 10

6-b. Evaluate $\int x^2e^x\,dx.$ (CO3,K3) 10

7. Answer any one of the following:-

7-a. Solve $3e^x \tan y\,dx + (1+e^x)\sec^2 y\,dy = 0$, given that $y(0)=\frac{\pi}{4}$. (CO4,K3) 10

7-b. Solve $(x^3+3xy^2)dx+(y^3+3x^2y)dy=0$. (CO4,K3) 10

8. Answer any one of the following:-

8-a. Solve for x and y, given that $\begin{bmatrix} x & y \\ 3y & x \end{bmatrix}\begin{bmatrix} 1 \\ 2 \end{bmatrix}=\begin{bmatrix} 3 \\ 5 \end{bmatrix}$. (CO5,K3) 10

8-b. Solve the following system of linear equation : $5x+2y=4$ and $7x+3y=5$. (CO5,K3) 10