Printed Page:-04 **Subject Code:- BBT0101**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2024- 2025)

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. If $x^2 = -4$ then the value of x is : (CO1,K1) 1

(a) 2i , -2i

(b) 2 , -2

(c) 0

(d) No solution

1-b. The region of the XOY-plane represented by the inequalities $x \geq 6, y \geq 2, 2x + y \geq 10$ is : (CO1,K1) 1

(a) unbounded

(b) a polygon

(c) exterior of a triangle

(d) none of these

1-c. 1

The value of $\lim_{x \to 0} \frac{\sin ax}{\sin bx}$ is . (CO2,K1)

(a) $\frac{a}{b}$

(b) $\frac{b}{a}$

(c) $-\frac{a}{b}$

.

(d) None of these

1-d. The derivative of $\frac{ax+b}{cx+d}$ is : (CO2,K1) 1

(a) $\frac{ad-bc}{(cx+d)^2}$

(b) $\frac{ad+bc}{(cx+d)^2}$

(c) $\frac{bc-ad}{(cx+d)^2}$

(d) None of these

1-e. The value of $\int \cos 5x\, dx$ is : (CO3,K1) 1

(a) $-\sin 5x + c$

(b) $\frac{1}{5}\sin 5x$

(c) $-\frac{1}{5}\sin 5x + c$

(d) None of these

1-f. The value of $\int \frac{3x^2}{x^6+1} dx$ is : (CO2,K1) 1

(a) $\sin^{-1}(x^3) + c$

(b) $\tan^{-1}(x^3) + c$

(c) $\sec^{-1}(x^3) + c$

(d) $\tan^{-1}(x^3) + c$

1-g. The degree of the differential equation: $\left[3+\left(\frac{dy}{dx}\right)^3\right]^{\frac{1}{2}} = x^5\frac{d^2y}{dx^2}$. (CO4,K1) 1

(a) 2

(b) 3

(c) 4

(d) 1

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 the polynomial $p(x)=x^4+2x^3-3x^2+x-1$ divided by $g(x)=x-2$,then remainder is1(CO5,

(a) 20

.

(b) 0

(c) 21

(d) none of these

1-j. A got 37.5% marks less than B, then by what percent the marks of B is more than the marks of A? (CO5,K1) 1

(a) 60%

(b) 37.5%

(c) 27.27%

(d) 40%

2. Attempt all parts:-

2.a. Draw the region $x+3y \leq 6$. (CO1,K2) 2

2.b. Evaluate $\lim_{x \to 3} \frac{x^2-9}{x-3}$.(CO2,K2) 2

2.c. Evaluate $\int \frac{e^{\tan^{-1}x}}{1+x^2} dx$. (CO3,K2) 2

2.d. Solve the differential equation $\frac{dy}{dx} = \frac{1+y}{1+x}$. (CO4,K3) 2

2.e. A number when increased by 25% became 150. Find the original number? (CO5,K2) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Solve: $15 < 3(x-2)/5 < 0$. (CO1,K3) 6

3-b. Solve : $\sqrt{5}\, x^2 - 4x - \sqrt{5} = 0$. (CO1,K3) 6

3-c. Find the derivative of $y = (x^2+1)\cos 2x$. (CO2,K2) 6

3-d. Show that the function $f(x) = \begin{cases} 3x-2, & \text{when } x < 0 \\ x+1, & \text{when } x \geq 0 \end{cases}$ is discontinuous at x = 0 . (CO2,K2) 6

3.e. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx$. (CO3,K2) 6

3.f. Solve $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$. (CO4,K3) 6

3.g. The average age of four boys, five years ago was 9 years. On including a new boy, the present average age of all the five is 15 years. What is present age of the new boy? (CO5,K2) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Solve the following system of inequalities graphically $x-2y \leq 3$, $4x+3y \geq 12$, $x \geq 1$, $y \geq 1$. (CO1,K3) 10

4-b. Ravi obtained 70 and 75 marks in first two unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks. (CO1,K2) 10

5. Answer any <u>one</u> of the following:-

5-a. if $y = \sin^{-1}x$ then prove that $(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} = 0$. (CO2,K3) 10

5-b. Find $\frac{dy}{dx}$ if $y = (\cos x)^{\cos x}$. (CO2,K2) 10

6. Answer any <u>one</u> of the following:-

6-a. Evaluate the rational function : $\int \frac{x}{(x-1)(x-2)(x-3)}\,dx$. (CO3,K2) 10

6-b. Evaluate $\int e^x \cos x\,dx$. (CO3,K2) 10

7. Answer any <u>one</u> of the following:-

7-a. Find the general solution of $\frac{dy}{dx} - y = e^x x \sin x$. (CO4,K2) 10

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

8. Answer any <u>one</u> of the following:-

8-a. .(a) The marked price of coat was 40% less than the suggested retail price. Eesha purchased the coat for half of the marked price at the 15th anniversary sale. What percent less than the suggested retail price did Eesha pay? 10
(b) Find the missing term of the given series 3, 5, 9, 17, 33, 65, ?
(c) A batsman had a certain average of runs for 16 innings. In the 17th innings, he made a score of 87 runs thereby increasing his average by 3. What is his average after 17 innings? (CO5,K2)

8-b. (a) Virat, Yuvi and Dhoni have certain number of mangoes with them. Yuvi has 10% less mangoes than Virat and Dhoni has 20% less than Virat. By what % is the number of mangoes with Yuvi more than those of Dhoni? 10
(b) The average monthly salary of 19 members of a group is Rs. 16000. If one more member whose monthly salary is Rs. 20000 joins the group, find the average salary of the group?
(c) Find the missing terms: 2, 11, 58, 295, 1482,? (CO5,K2)