NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - CARRY OVER THEORY EXAMINATION - MAY 2023

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.*

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SECTION A   **20**

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1. Attempt all parts:-

1-a.   The solution of the $-12 < (4 - 3x)/(-5) < 2$ is   (CO1)   1

        (a) $56/3 < x < 14/3$

        (b) $56/3 < x < 14/3$

        (c) $56/3 < x < -14/3$

        (d) $-56/3 < x < 14/3$

1-b.   Solve: $f(x) = \{(x - 1) \times (2 - x)\}/(x - 3) \geq 0$ (CO1)   1

        (a) $(-\infty, 1] \cup (2, \infty)$

        (b) $(-\infty, 1] \cup (2, 3)$

        (c) $(-\infty, 1] \cup (3, \infty)$

        (d) None of these

1-c.   Evaluate $\lim_{x \to 1} 3x^2 + 4x + 5$.   (CO2)   1

        (a) 3

        (b) 10

        (c) 12

(d) -12

1-d. Find $f''(2)$ if $f(x) = 3x + 5x^2.$ (CO2) 1

    (a) 80

    (b) 10

    (c) 78

    (d) None of these

1-e. The value of $\int_2^4 \frac{1}{x} dx$ is (CO3) 1

    (a) $\log 4$

    (b) $3\log 2$

    (c) $\log 2$

    (d) None of these

1-f. The value of $\int_0^{\frac{\pi}{4}} \sin 2x \, dx$ is (CO3) 1

    (a) $\frac{1}{4}$

    (b) 2

    (c) $\frac{1}{2}$

    (d) None of these

1-g. The general solution of the differential equation $\log\left(\frac{dy}{dx}\right) = x - 2y$ is (CO4) 1

    (a) $2e^x + e^{2y} = c$

    (b) $e^x + \frac{e^y}{2} = c$

    (c) $\frac{e^{2y}}{2} = e^x + c$

    (d) $e^{-y} + e^{-x} = c$

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

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

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

    (c) $(x^3 + 2y^2)dx + 2xy\,dy = 0$

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

1-i. If 35+48=40, 23+34=24, 15+25=26, then 11+21=? (CO5) 1

    (a) 15

    (b) 18

(c) 20

(d) 10

1-j. A man bought 18 oranges for a rupee and sold them at 12 oranges for a rupee. What is the profit percentage? (CO5)   1

        (a) 50%

        (b) 75%

        (c) 85%

        (d) None

2. Attempt all parts:-

2.a. Solve the following inequality $3(1-x) < 2(x+4)$. (CO1)   2

2.b. Evaluate $\lim\limits_{x \to 3} \dfrac{x^2-9}{x-3}$. (CO2)   2

2.c. Evaluate $\int x \log x \, dx$. (CO3)   2

2.d. Find the general solution of the differential equation $\log \dfrac{dy}{dx} = 2x + 3y$. (CO4)   2

2.e. Simplify the following expression $5 \times 2 - [3 - \{5 - (7 + 2 \times 4 - 19)\}]$. (CO5)   2

SECTION B   **30**

3. Answer any <u>five</u> of the following:-

3-a. *Solve* $4x^2 - x > 12$. (CO1)   6

3-b. *Solve* $3x^2 - 2x + 2 = 0$. (CO1)   6

3-c. Find the derivative of $\cos x$ from first principle. (CO2)   6

3-d. Differentiate $\dfrac{x^2+1}{x+1}$. (CO2)   6

3.e. Evaluate $\int \dfrac{1}{x(\log x)^m} dx$. (CO3)   6

3.f. Solve $x\dfrac{dy}{dx} + 2y = x^2 \log(x)$. (CO4)   6

3.g. A man bought a cycle for Rs250. For how much should he sell it so as to gain 10%? (CO5)   6

SECTION C   **50**

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

4-a. *Solve* $3x^2 - 2x + \dfrac{10}{3} = 0$. (CO1)   10

4-b. $Solve\ \dfrac{x-2}{x+5} > 2.$ (CO1) 10

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

5-a. If $y = \sin^{-1}x$, show that $(1-x^2)y_2 - xy_1 = 0.$ (CO2) 10

5-b. If $y = \cos^{-1}x$, find $\dfrac{d^2y}{dx^2}$ in terms of y alone. (CO2) 10

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

6-a. Evaluate $\displaystyle\int \dfrac{1}{\sqrt{9x-4x^2}}dx$. (CO3) 10

6-b. Evaluate $\displaystyle\int \dfrac{x+2}{x^2+2x+5}dx$. (CO3) 10

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

7-a. Solve $\dfrac{dy}{dx} + 2y\tan(x) = \sin(x)$ when $y\left(\dfrac{\pi}{3}\right) = 0.$ (CO4) 10

7-b. Solve $\dfrac{dy}{dx} = y\sin(2x),$ given that $y(0) = 1.$ (CO4) 10

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

8-a. (CO5) 10

(i) A shopkeeper allows a 10% discount of to his customers and still gains 20%. Find the marked price of the article which costs Rs 450.

(ii) The average of marks of 17 students in an examination was calculated as 71. But it was later found that the mark of one student had been wrongly entered as 65 instead of 56 and another as 24 instead of 50. The correct average is

(iii) If the numerator of a fraction is increased by 20% and its denominator is decreased by 10%, the fraction becomes 3/2. Find the original fraction.

8-b. (i) If the radius of the cylinder increases by 10 % and the height increases by 20%. Then, what is the change in the volume of the cylinder ? (CO5) 10

(ii) The average age of eight teachers in a school is 40 years. A teacher among them died at the age of 55 years whereas another teacher whose age was 39 years joins them. The average age of the teachers in the school now is (in years)

(iii) A machine is sold for Rs5060 at a gain of 10%. What would have been the gain or loss % if it had been sold for Rs 4370?