NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: I - CARRY OVER THEORY EXAMINATION - SEPTEMBER 2022

Subject: Elementary Mathematics

Time: 3 Hours   Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.

2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 mark each.

3. Section B - Question No-3 is based on external choice carrying 6 marks each.

4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.

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

<div align="center">SECTION A   20</div>

1. Attempt all parts:-

1-a.   By solving the inequality $6x - 7 > 5$, the answer will be   (CO1)   1

                 (a) $x > 6$

                 (b) $x < 5$

                 (c) $x < 7$

                 (d) $x > 2$

1-b.   The solution of $x^2 + x + 4 = 0$ is   (CO1)   1

                 (a) $\dfrac{-1 \pm \sqrt{13}\,i}{2}$

                 (b) $\dfrac{-1 \pm \sqrt{15}\,i}{2}$

                 (c) $\dfrac{-1 \pm \sqrt{14}\,i}{2}$

                 (d) $\dfrac{-1 \pm \sqrt{15}}{2}$

1-c.   Evaluate $\displaystyle\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$.   (CO2)   1

(a) 2

(b) 3

(c) 0

(d) 6

1-d.   Differentiate a^x w.r.t. x, where a is a positive constant.   (CO2)   1

(a) a^x

(b) $a^x \log x$

(c) $a^x \log c$

(d) None of these

1-e. $\int_0^{\frac{\pi}{2}} \cos x \, dx$ equals to (CO3)   1

(a) 0

(b) $\dfrac{\pi}{2}$

(c) 1

(d) $\dfrac{\pi}{4}$

1-f.   The value of $\int x\sqrt{1+x^2}\, dx$ is equal to (CO3)   1

(a) $\dfrac{1+2x^2}{\sqrt{1+x^2}} + c$

(b) $\sqrt{1+x^2} + c$

(c) $3(1+x^2)^{3/2} + c$

(d) $\dfrac{1}{3}(1+x^2)^{3/2} + c$

1-g.   The order and degree of the differential equation: $x\left(\dfrac{d^2y}{dx^2}\right)^2 + 4\left(\dfrac{dy}{dx}\right)^3 + 8y = 7$ is   (CO4)   1

(a) 2 , 2

(b) 2 , 3

(c) 1 , 3

(d) 3 , 2

1-h. $y = e^{-3x}$ is a solution of the differential equation $\dfrac{d^2y}{dx^2} + 6\dfrac{dy}{dx} - 6y = 0$ is (CO4)   1

(a) True

(b) False

1-i.	If out of 10 selected students for an examination, 3 were of 20 years, age, 4 of 21 and 3 of 22 years, the average age of the group is (CO5)	1

       (a) 22 years

       (b) 21 years

       (c) 21.5 years

       (d) 20 years

1-j.	In a certain code language, 732 means 'intelligent trained faculty' 285 means 'highly intelligent student', 816 means 'student and teacher'. Which numerical symbol in that code language stands for 'highly'?	(CO5)	1

       (a) 2

       (b) 7

       (c) 8

       (d) 5

2. Attempt all parts:-

2.a.	Solve the following quadratic equation (CO1)	2
$$x^2 + 15x + 50 = 0.$$

2.b.	Write the conditions for the existence of limit. (CO2)	2

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

2.d.	Form the differential equation by eliminating arbitrary constant a from the equation $x^2 + y^2 = a^2$. (CO4)	2

2.e.	If in a certain code "RANGE" is coded as 12345 and "RANDOM" is coded as 123678. Then the code for the word "MANGO" would be? (CO5)	2

SECTION B	30

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

3-a.	Numerator of the fraction is 2 less then denominator. If we lower the numerator of this fraction by one and we increase denominator by 3, the fraction shall be equal ¼. Determine the fraction. (CO1)	6

3-b.	Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11. (CO1)	6

3-c.	Differentiate $\sin(\cos x^2)$ with respect to x (CO2).	6

3-d.	Find the derivative of $y = 9x^2 + \dfrac{3}{x} + 5 \tan^{-1}x$ with respect to x. (CO2)	6

3.e.	Evaluate	6

$\int \frac{x}{e^{x^2}} dx$. (CO3)

3.f. Find the general solution of $\frac{dy}{dx} = \frac{x+1}{2-y}$, $y \neq 2$. (CO4) 6

3.g. In an examination, 34% of the students failed in Mathematics and 42% failed in English. If 20% of students failed in both the subjects, then find the percentage of students who passed. (CO5) 6

<div align="center">SECTION C   50</div>

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

4-a. Solve the inequality, $3x - 5 < x + 7$ when 10
(i) x is a natural number.
(ii) x is a whole number.
(iii) when x is an integer. (CO1)

4-b. Solve the following system inequalities graphically: $x + 2y \leq 10$, $x + y \geq 1$, $x - y \leq 0$, $x \geq 0$, $y \geq 0$. (CO1) 10

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

5-a. If $y = 3e^{2x} + 2e^{3x}$ then prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$. (CO2) 10

5-b. Find the maximum and minimum value if any, of the following function $f(x) = (2x-1)^2 + 3$. (CO2) 10

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

6-a. Find the area bounded by parabola $y^2 = 4x$ and a line $y = x$. (CO3) 10

6-b. Evaluate $\int e^{\log \sin x} \cos^3 x \ dx$. (CO3) 10

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

7-a. Solve the differential Equation $x\frac{dy}{dx} = x + y$. (CO4) 10

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

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

8-a. (i) If the price of an item is decreased by 10% and then increased by 10%,then find the net effect on the price of the item. 10

(ii) The average marks obtained by 40 students of a class is 86. If the 5 highest marks are removed, the average reduced by one mark. Find the average marks of the top 5 students.

(iii) Find the missing terms: 1, 2, 6, 7, 21, 22, 66, 67, ? (CO5)

8-b.   (i) Pankaj purchased an item for Rs. 7500 and sold it at the gain of 24%. From that amount   10
he purchased another item and sold it at the loss of 20%. What is his overall gain/loss?

(ii) The average of runs of a cricket player of 20 innings was 32. How many runs must he
make in his next innings so as to increase his average of runs by 4 ?

(iii) In certain code language, ROCK=47 and LATE=38. Find the code for FOOL. (CO5)