

Roll No: **NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA****(An Autonomous Institute Affiliated to AKTU, Lucknow)****B.Tech.****(SEM: First THEORY EXAMINATION (2020-2021))****Subject Name: Elementary Mathematics****Time: 3 Hours****Max. Marks:100****General Instructions:**

- All questions are compulsory. Answers should be brief and to the point.
- This Question paper consists of 02 pages & 8 questions.
- It comprises of three Sections, A, B, and C. You are to attempt all the sections.
- **Section A** - Question No- 1 is objective type questions carrying 1 mark each, Question No- 2 is very short answer type carrying 2 mark each. You are expected to answer them as directed.
- **Section B** - Question No-3 is Long answer type -I questions with external choice carrying 6 marks each. You need to attempt any five out of seven questions given.
- **Section C** - Question No. 4-8 are Long answer type -II (within unit choice) questions carrying 10marks each. You need to attempt any one part a or b.
- Students are instructed to cross the blank sheets before handing over the answer sheet to the invigilator.
- No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION – A**1. Answer all the parts-**

- | | | |
|----------------------------------------------------------------------------------------------------------------------------|------------------|-------------|
| | [10×1=10] | CO |
| a. The roots of quadratic equation $9x^2 + 16 = 0$ are | (1) | CO 1 |
| (a) $\frac{4}{3}, -\frac{4}{3}$ | | |
| (b) $\frac{4}{3}i, -\frac{4}{3}i$ | | |
| (c) $\frac{3}{4}, -\frac{3}{4}$ | | |
| (d) $\frac{3}{4}i, -\frac{3}{4}i$ | | |
| b. The solution set of the inequality $24x < 100$, where x is a natural number, is | (1) | CO 1 |
| (a) {0,1,2,3} | | |
| (b) {0,1,2,3,4} | | |
| (c) {1,2,3,4} | | |
| (d) {1,2,3} | | |
| c. The domain of the function $\frac{1}{\sqrt{x-2}}$ is $[2, \infty)$. (T/F) | (1) | CO 2 |
| d. The value of $\lim_{x \rightarrow 2} \frac{x^2-4}{x-2}$ is | (1) | CO 2 |
| e. The value of $\int \sec x (\sec x + \tan x) dx$ is | (1) | CO 3 |
| f. The value of $\int_0^1 \frac{1}{1+x^2} dx$ is $\frac{\pi}{2}$. (T/F) | (1) | CO 3 |
| g. The degree of the differential equation $\left(1 + \frac{dy}{dx}\right)^3 = \left(\frac{d^2y}{dx^2}\right)^2$ is | (1) | CO 4 |
| (a) 1 | | |
| (b) 2 | | |
| (c) 3 | | |
| (d) 4 | | |
| h. Solution of differential equation $\frac{dx}{x} + \frac{dy}{y} = 0$ is $xy = c$. (T/F) | (1) | CO 4 |

- i. A person bought an article for Rs. 240. For how much should he sell it so as to gain 20%? (1) CO 5
- j. Find the missing term in the series 55 60 67 78 91 108 (1) CO 5
2. **Answer all the parts-** [5×2=10] CO
- a. Solve $x^2 - 5ix - 6 = 0$. (2) CO 1
- b. Find the derivative of $y = x^2 \sin x + \cos^{-1} x$ with respect to x . (2) CO 2
- c. Find $\int x \cos x \, dx$. (2) CO 3
- d. For a differential equation representing the family of curves $y = A \sin x$, by eliminating the arbitrary constant. (2) CO 4
- e. What percentage is equivalent to $\frac{5}{8}$? (2) CO 5
- SECTION – B** CO
3. **Answer any five of the following-** [5×6=30]
- a. Solve the inequality $5x + 2y \leq 10$ graphically. (6) CO 1
- b. Compute the derivative of $f(x) = \sin x$ with respect to x by first principle. (6) CO 2
- c. Find $\int \frac{x-1}{(x-2)(x-3)} \, dx$. (6) CO 3
- d. Solve the differential equation $(1 + x^2) \frac{dy}{dx} + y = e^{\tan^{-1} x}$. (6) CO 4
- e. The average of 15 results is 60. If the average of first eight results is 58 and that of last eight is 61, find the eighth result. (6) CO 5
- f. If $y = x^x$, then prove that $\frac{d^2y}{dx^2} - \frac{1}{y} \left(\frac{dy}{dx} \right)^2 - \frac{y}{x} = 0$. (6) CO 2
- g. Find $\int_0^1 \frac{\tan^{-1} x}{(1+x^2)} \, dx$. (6) CO 3
- SECTION – C** CO
4. **Answer any one of the following-** [5×10=50]
- a. Solve the system of inequalities graphically $x + y > 6$; $2x - y < 0$. (10) CO 1
- b. Solve the inequality $\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$ and show the graph of the solution on number line. (10) CO 1
5. **Answer any one of the following-**
- a. Show that the function $f(x) = |x - 3|$, $x \in R$, is continuous but not differentiable at $x = 3$. (10) CO 2
- b. Show that the semi-vertical angle of the cone of the maximum volume and of given slant height is $\tan^{-1} \sqrt{2}$. (10) CO 2
6. **Answer any one of the following-**
- a. Evaluate $\int_0^{\pi/2} \log(\sin x) \, dx$. (10) CO 3
- b. Find the area of the region included between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$, where $a > 0$. (10) CO 3
7. **Answer any one of the following-**
- a. Find the general solution of the differential equation $\tan y \sec^2 x \, dx + \tan x \sec^2 y \, dy = 0$. (10) CO 4
- b. Find the general solution of the differential equation $x \frac{dy}{dx} + 2y = x^2 \log x$. (10) CO 4
8. **Answer any one of the following-**
- a. In a certain code, LONDON is coded as 24-30-28-8-30-28. How will FRANCE be coded? (10) CO 5
- b. Find the value of $\frac{1}{2 + \frac{1}{2 + \frac{1}{2 - \frac{1}{2}}}}$. (10) CO 5