

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BCA
BRANCH: BCA

SEMESTER : III/ADD
SESSION : MO/2025

SUBJECT: CN207 MATHEMATICS FOR COMPUTING - II

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Construct a complete truth table and check if the following statement is a tautology, contradiction, or contingency: [5] CO BL
 $(q \Rightarrow \sim r) \vee (\sim p \Rightarrow r) \wedge (q)$ CO1 3
- Q.1(b) Write the negation of the following English sentences: [5] CO1 2, 4
(i) Today is Sunday and the college is not open.
(ii) Every triangle has three equal sides.
- Write the contrapositive of the following sentence:
If the fruit is an apple, then it is red
- Q.2(a) Check the validity of the following argument: [5] CO2 4, 5
If it rains then the street gets wet
If the street gets wet then the traffic is slow
The streets are not wet

Therefore, it did not rain and the traffic is not slow
- Q.2(b) State the principle of mathematical induction. [5] CO2 2, 3
Prove the following by using mathematical induction
$$1 + 3 + 5 + \dots + (2n - 1) = n^2$$
- Q.3(a) Find GCD of 77 and 126 using Euclidean algorithm. [5] CO3 2, 3
If $d = \text{GCD}(77, 126)$, then find the value of p and q if $d = 77p + 126q$.
- Q.3(b) Under which condition the linear congruence $ax \equiv b \pmod{m}$ does not have any solution? [5] CO3
Find one positive and one negative value of x such that $12x \equiv 9 \pmod{15}$
- Q.4(a) Find the inverse of the following matrix by Gauss-Jordan method. [5] CO4 3
$$\begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$$
- Q.4(b) What are eigen values of a square matrix? Find the Eigen values of the following [5] CO4 3
matrix.
$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & 9 \end{bmatrix}$$

Q.5(a) In a college of 450 students, there are two societies A and B. A student of the college may or may not join the societies. There are 120 students who are members of the society A. It is known that 50 students are members of both the societies and 270 students are members of at least one society. A student is selected randomly. [5] CO5 2, 3, 4

(i) What is the probability that the student is a member of society B?

(ii) What is the probability that the student is neither a member of society A nor B?

Q.5(b) What is the probability mass function of Poisson distribution? [5] CO5 3, 4

A sample of 100 dry battery cells tested to find the length of life produce the following results:

Average length of life: 14 hours, S. D.: 3 hours.

Assuming that the data are normally distributed, what percentage of battery cells are expected to have life (i) more than 18 hrs., (ii) less than 8 hrs. and (iii) between 15 and 18 hrs.

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