NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Department of Civil Engineering

MID SEMESTER EXAMINATION, Jan-June 2025

B.Tech: Semester-2 170823

Course Name: Building Materials and Construction Techniques **Course Code: CE23102**

Maximum Time: 2 hours **Max. Marks: 30**

Instruction:

1. Attempt any three questions. All questions carry equal marks.
2. Assume any suitable data, if necessary.
3. The Marks, CO (Course Outcome) and BL (Bloom's Level) related to questions are mentioned on the right-hand side margin.

S.No.	***Answer Any Three Questions.***	**Marks**	**CO**	**BL**
1.	What is building stone? Describe characteristics of good building stones.	10	CO1	2
2.	(a) What are bricks? Describe different types of bricks and their characteristics and where are it is used? (b) What are the constituents of good brick earth?	5+5	CO1	2
3.	(a) What is cement? Describe various types of cement and write a typical chemical analysis of a good ordinary cement. (b) Describe properties, uses of a good cement.	5+5	CO1	2
4	(a) What is concrete and concrete technology? Describe ingredients of concrete and general properties of concrete? (b) What is sand and surkhi? Describe types of sand and characteristics of good sand?	5+5	CO2	3
5	Write short notes on any two of the following: (a) What are the suitability of stone for various types of construction? (b) Describe manufacture of cement by wet process with flow diagram (c) Properties of concrete in plastic state and hardnened state.	5+5	CO2	3

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Roll No.: | | | | | | | |

राष्ट्रीय प्रौधोगिकी संस्थान पटना

NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Ashok Rajpath, Patna, Bihar, 800 005

MID SEMESTER EXAMINATION, MARCH – 2025

Program Name	B. Tech & B. Tech Dual	**Branch Name**	Civil Engineering
Course Name	Surveying & Field Practice	**Course Code**	CE23103
Date of Exam	06–03–2025	**Time**	03:30 pm to 05:30 pm
Time Duration	2 Hours	**Maximum Marks**	30

Instructions:

- **Part A is compulsory.**
- **Attempt any four questions from Part B.**
- **Attempt any one question from Part C.**

PART A (4×1=4)

1. Short answer type questions

(a) Define the term: **Surveying**

(b) Define the term: **Most Probable value**

(c) Invar tape is an alloy of _____ & _____. (Also, mention percentage)

(d) Convert Whole Circle Bearing into Quadrantal Bearing.

i) 90°

ii) 275° 45' 28"

PART B (4×4=16)

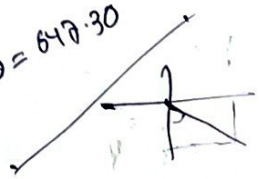
2. A base line was measured to be 150 m long with tape at a field temperature of 27°C and the pull applied was 14 kg. The tape was standardised at a temperature of 15°C with a pull of 8 kg. If the designated length of the tape is 20 m, weight of 1 cm^3 of tape = 7.86 kg, weight of tape = 0.8 kg. Find the true length of line. Take Modulus of elasticity = $2.109 \times 10^6 kg/cm^2$ & Co-efficient of expansion of tape = $11.2 \times 10^{-6}/°C$

3. Give the difference between Prismatic compass and Surveyor's compass.

4. A & B are two points 200 m apart along one bank of a river flowing East – West. The bearings of a tower on the other bank as observed from A & B are 40° & 310° respectively. Find the width of the river.

5. Discuss in brief the principles of surveying.

6. The consecutive co-ordinates of a line AB are – 647.30 & + 457.20 with reference to the magnetic meridian. Calculate its co-ordinates with reference to the true meridian. Given that the magnetic declination is 10° 08' E.



PART C (10×1=10)

7. The length and bearing of a closed traverse ABCDA, as observed with a transit theodolite are given below:

Line	Length (m)	At station	Interior angle	W.C.B
		A	95° 24'	86° 42'
AB	250			
		B	88° 42'	
BC	123			
		C	88° 12'	
CD	256			
		D	88° 06'	
DA	108			
		A		

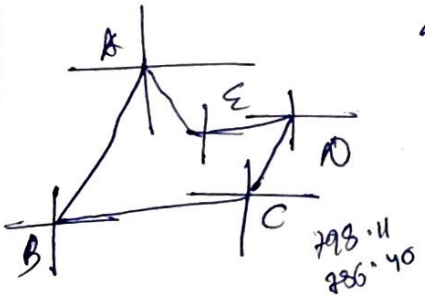
Note: For calculating corrections to latitudes and departures, use transit rule.

a) Prepare a Gale's traverse table. (7)
b) Plot the traverse. (3)

8. a) Give the classification of surveying based on the object of survey? (2)
b) Discuss the duties of a surveyor? (2)
c) Find which station is free from local attraction and work out correct bearings by using the method of **calculating the local attraction at each station** (6)

Side	Fore Bearing	Back Bearing
AB	191° 30'	13° 00'
BC	69° 30'	246° 30'
CD	32° 15'	210° 30'
DE	262° 45'	80° 45'
EA	230° 15'	53° 00'

*****Good Luck*****



∠A =

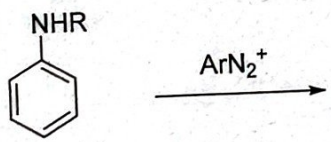
∠B = BC − AB

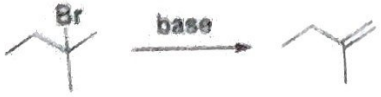
∠C

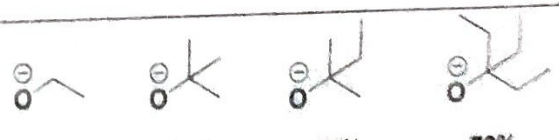
NATIONAL INSTITUTE OF TECHNOLOGY, PATNA
MID-SEMESTER EXAMINATION, JAN - JUN 2025

Program: B.Tech; Semester: 2nd **Batch: CE – II** **Department: CE**
Course Code: CH23101 **Course Name: Engineering Chemistry**
Full Marks: 30 **Duration of Examination: 2 hours**

All questions are compulsory

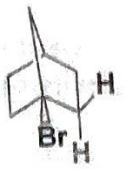
Q1	Given the equivalent conductance of sodium butyrate, sodium chloride and HCl are 89, 145 & 468 $ohm^{-1}cm^2$ @ 298 K respectively. Calculate the equivalent conductance of butyric acid at infinite dilution.	02	CO2
Q2	Find out the normalization constant for bonding and antibonding wavefunction of a hydrogen molecule H_A-H_B.	02	CO3
Q3	Elaborate the distinction between basicity and nucleophilicity in terms of HSAB theory.	02	CO4
Q4	In the context of molecular orbital theory, list out the conditions required for linear combination of atomic orbitals.	03	CO3
Q5	Describe strong and weak electrolytes with example. Derive the relation for transport number w.r.t the velocity of cations and anions.	04	CO2
Q6	How the equivalent conductance of strong and weak electrolyte varies with dilution? Draw the graph for each case. Explain with proper reasoning.	04	CO2
Q7	What is the reagent employed for diazotization of aniline? Show the mechanism of diazotization of aniline. Predict the products with mechanism in the following case: - 	04	CO4
Q8	a) Explain with mechanism the increasing percentage of the Hofmann eliminated product along the series	04	CO4

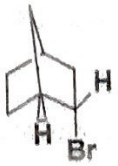


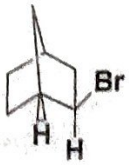
Base = 

30% 72% 77% 78%

b) Predict the compound(s) which will undergo elimination reaction. Show the eliminated product along with mechanistic justification.

i) 

ii) 

iii) 

Q9	In a hydrogen molecule H_A-H_B, draw the wavefunction qualitatively for: - a) Individual hydrogen atoms b) Bonding wave function involving hydrogen atoms c) Probability function for bonding orbital d) Antibonding wave function involving hydrogen atoms e) Probability function for antibonding orbitals	05	CO3

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MID SEMESTER EXAMINATION

Elements of Civil Engineering (CE23105)

Answer all questions in your own words.
Time Duration: 02:00 hrs

Date: 07/03/2025
Full Marks: 30

SN	Question	BL	CO	Marks
1	Explain the scope for a carrier in civil engineering.	L2	CO1	[5 M]
2	Briefly explain the impact of civil engineering on the economy.	L3	CO1	[5 M]
3	What is meant by Smart City? Explain it features.	L2	CO2	[2+6 = 8 M]
4	Why sand is used for making mortar? Explain why sea sand should not be used for making mortar.	L2	CO1	[2.5+2.5 = 5M]
5	Briefly explain the role of engineered sustainable infrastructure for overall development of Bihar.	L3	CO2	[7 M]

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Department Of Mathematics & Computing Technology
Mid-Semester Examination – March 2025
Engineering Mathematics (MA23101)
Branch: B.Tech-M.Tech-DD-CE-CTM-2

Time: 2 Hours

Maximum Marks: 30

All questions are of equal value. Answer any eight questions.

1. Reduce the matrix

$$A = \begin{bmatrix} 3 & -4 & -1 & 2 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 9 & -3 & 7 & 7 \end{bmatrix}$$

to canonical form and find the rank of the matrix A.

2. Solve the system of linear equations:

$$\begin{aligned} 2x_1 + x_2 + 2x_3 + x_4 &= 6 \\ 6x_1 - 6x_2 + 6x_3 + 12x_4 &= 36 \\ 4x_1 + 3x_2 + 3x_3 - 3x_4 &= -1 \\ 2x_1 + 2x_2 - x_3 + x_4 &= 10 \end{aligned}$$

3. Using Cayley-Hamilton theorem, find A^{-1} where:

$$A = \begin{bmatrix} 4 & 3 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & 1 \end{bmatrix}$$

4. Find a matrix P which transforms matrix

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$

to its diagonal form, i.e., diagonalize matrix A. Hence, find A^4.

5. Find a basis and the dimension of the subspace W of $\mathbb{R}^4$, where

$$W = \{(a, b, c, d) : a + c + d = 0, \quad b + c + d = 1\}$$

6. Let $T : \mathbb{R}^3 \to \mathbb{R}^3$ be the linear operator defined by:

$$T(x, y, z) = (x + 2y - z, y + z, x + y - 2z)$$

Find a basis and the dimension of the image of T and kernel of T.

7. Test the convergence of the series:

$$\sum \frac{(n!)^2}{(2n)!} x^{2n}$$

8. Discuss the convergence of the series:

$$\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p}, \quad (p > 0)$$

9. Solve the differential equation:

$$\frac{dy}{dx} + \frac{y\cos x + \sin y + y}{\sin x + x\cos y + x} = 0$$

MID SEMESTER EXAMINATION, March 2025

UG (CIVIL): Semester-2

Course Name: = ENVIRONMENTAL SCIENCE AND BUILDING SANITATION

Course Code: CE23104

Maximum Time: 2 hours

Max. Marks: 30

Date of Examination: 10th March (ES)

Answer all questions.

Marks are given in bracket along with the question.

The Marks, CO (Course Outcome) and BL (Bloom's Level) related to questions are mentioned on the right-hand side margin.

S No.	Questions	Marks	CO	BL
1 (a)	Enumerate some environmental issues having global implications?	5		
(b)	Discuss the need of public awareness in environmental study?	5		
2 (a)	Enumerate the activities which are threatening biodiversity:	5		
(b)	Describe the steps to control water pollution?	5		
3 (a)	Discuss the various approaches to conserve biodiversity?	5		
(b)	Discuss the Source – Path – Receiver strategy to control noise pollution?	5		