



# जनपदीय अभियांत्रिकी विभाग/ CIVIL ENGINEERING DEPARTMENT

राष्ट्रीय प्रौद्योगिकी संस्थान पटना/ NATIONAL INSTITUTE OF TECHNOLOGY PATNA

अशोक राजपथ, पटना - 800005, बिहार/ ASHOK RAJPATH, PATNA - 800005, BIHAR

शिक्षा मंत्रालय, भारत सरकार के अधीन एक राष्ट्रीय महत्व का संस्थान/ An Institute of National Importance under Ministry of Education, Govt. of India

## END SEMESTER EXAMINATION

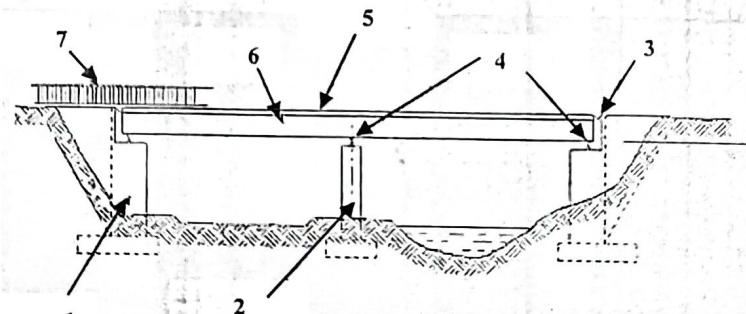
### Elements of Civil Engineering (CE23105)

Answer any **SIX** questions.

Time Duration: 03:00 hrs

Date: 06/05/2024

Full Marks: 60

1	Show the following components of dam by making a cross section of dam: Crest, Heel, Toe, Spillways, Gallery, and Freeboard. Also discuss the significance of the each of the components. [4+6]	L4	CO2	[10M]
2	Discuss the <b>harmful</b> ingredients in Earth Brick. [5×2]	L3	CO4	[10M]
3	Draw a flow chart of water treatment plant. Also mention the range of the following parameters in the drinking water: Hardness, Fluoride, Chloride, Sulphate and Nitrite. [5+5]	L2	CO3	[10M]
4	Discuss different types of irrigation techniques used for water distribution to irrigate the land. [5×2]	L4	CO4	[10M]
5	Write the physical and engineering properties of soil. Also explain the significance of these properties in soil mechanics. Write the name of instruments which is used to find out the engineering properties of soil. [4+4+2]	L5	CO4	[10M]
6	Write the type of bridge shown in the Fig. 1. Also name of different components of bridge shown in numerals and, discuss the significance of each components.	L2	CO2	[10M]
	 <p>Fig. 1</p>			[2+8]
7	<p>Explain, any <b>five</b>, briefly the following:</p> <ol style="list-style-type: none"> <li>Greenhouse gases</li> <li>Carbon foot print</li> <li>Photochemical smog</li> <li>Acid rain</li> <li>Global warming</li> <li>Air pollution</li> <li>Noise Pollution</li> </ol>	[5×2]	L2	CO2 [10M]

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**Department of Civil Engineering**  
**END SEMESTER EXAMINATION, MAY 2024**

**UG (CIVIL): Semester-2**

**Course Name: = ENVIRONMENTAL SCIENCE AND BUILDING SANITATION**

**Course Code: CE23104**

**Maximum Time: 3 hours**

**Max. Marks: 60**

**Date of Examination: 8<sup>th</sup> May 2024 (AN)**

**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)	Explain Sustainable Development and key aspects for sustainable development?	6		
(b)	Suggest some measures to reduce air pollution?	6		
2(a)	Elaborate 3R's in solid waste management?	6		
(b)	Enumerate the role of plumbing and sanitation in buildings? Before starting this works, what points should be taken into consideration?	6		
3(a)	Assess the various solid waste management practices in rural areas?	6		
(b)	Describe how our biodiversity can be conserved with suitable examples?	6		
4(a)	Explain the types of solid waste generated from a city?	4		
(b)	What is sewage? How is it collected from houses?	3		
©	Define water supply system? What are the basic components of it?	5		
5(a)	Discuss the process of Ecological succession?	6		
(b)	Explain how energy and nutrients flows in an ecosystem with examples?	6		

END-SEMESTER EXAMINATION MAY-2024  
DEPARTMENT OF MATHEMATICS  
NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Course Title: ENGINEERING MATHEMATICS (MA23101) Maximum Marks: 60  
Time: 3 hrs. Section: B

Branch: Civil Engineering (2nd Sem Section-B)

Branch: Civil Engineering  
Answer all questions. All questions are of equal value.

Answer all questions. All questions are of equal value.

1. Expand  $x^2y + 3y - 2$  in Taylor's series about the point  $(-1, 2)$ .
  2. Find shortest distance between the line  $y = 10 - 2x$  and the ellipse  $\frac{x^2}{4} + \frac{y^2}{9} = 1$ .
  3. Solve  $(D^2 - 4D + 4)y = 8x^2e^{2x} \sin 2x$ .
  4. Solve  $\frac{d^2y}{dx^2} + a^2y = \sec ax$ .
  5. Using method of variation of parameters, solve  $\frac{d^2y}{dx^2} + 4y = \tan 2x$ .
  6. Solve  $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = \log x$ .
  7. Solve the following system of simultaneous equations:

$$\frac{dx}{dt} + 5x - 2y = t$$

$$\frac{dy}{dt} + 2x + y = 0$$

given  $x = y = 0$ , when  $t = 0$ .

8. Prove that  $e^{\frac{x}{2}(t-\frac{1}{t})} = \sum_{n=-\infty}^{\infty} t^n J_n(x)$ .
  9. Prove that  $P_n(x) = \frac{1}{2^n n!} \frac{d^n(x^2-1)^n}{dx^n}$ .
  10. Express  $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$  in terms of Legendre's polynomial.

\*\*\*\*\* All The Best\*\*\*\*\*

**NATIONAL INSTITUTE OF TECHNOLOGY PATNA**  
 Department of Civil Engineering  
**END SEMESTER EXAMINATION, Jan-June 2023**

**B.Tech: Semester-2**

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

**Maximum Time: 3 hours**

**Course Code: CE23102**  
**Max. Marks: 60**

**Instruction:**

1. Attempt *any five* questions.
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.N.	<i>Answer any five questions.</i>	Marks	CO	BL
1.	(a) What is bonding and Rules of bonding? (b) Describe important types of brick bonds with neat sketches.	6+6	1	2
2.	(a) Compare between English bond and Flemish bond. (b) Compare between stone masonry and brick masonry.	6+6	1	2
3.	(a) What is floor? What are the materials normally used for the construction of floor? (b) Describe various parts of an arches.	6+6	3	2
4.	(a) Describe the functions of various constituent of glass. (b) Describe classifications of bridges according to materials and to the position of high flood level.	6+6	2	2
5.	(a) Describe purpose of plastering and requirements of ideal plaster. (b) Explain properties of plastics and where it is used in building construction.	6+6	4	3
6.	(a) State briefly the requirements of good stair case. (b) What do you understand by the term foundations and list the various types of foundations and causes of foundation failure.	6+6	4	3
7.	Write short notes on any two of the following: (i) Cause of dampness and materials used for damp roofings (ii) Scaffolding and shoring (iii) Types of lintels (iv) Pointing and under pinning	6+6	2	2

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**NATIONAL INSTITUTE OF TECHNOLOGY PATNA**  
**DEPARTMENT OF CIVIL ENGINEERING**

End Semester Examination, Jan-June 2024

B. Tech/ B. Arch.: Semester 2/4

Course Code: CE23103/ CE41133

Title: Surveying and Field Practice / Surveying

Date: 14/05/2024

Maximum Time: 3 Hours

- Read the questions carefully and answer them to the point. Assume any suitable and valid assumption (if required) and state that clearly.
- Use of mobile & electronic gadgets is not allowed & exchange of calculators is not permitted.

**Answer ALL Questions**

**(5 × 12 = 60)**

Q. No.	Questions	Marks	CO	BL															
1 (a)	(i) Describe with sketches about all types of obstacles that interrupts chain surveying with two examples each.	12	CO1	BL2															
(or)																			
1 (b)	(i) The plan of an area has shrunk such that a line originally 10 cm now measures 9.8 cm. The original scale of the plan was 1 cm = 10 m. Determine the following: a) Shrinkage Factor b) Shrunk Scale c) Correct distance corresponding to a measured distance of 90 m. Correct area corresponding to a measured area of 14000 m <sup>2</sup> . (ii) The length of a line measured with a chain was found to be 250 m. Calculate the true length of the line if a) The length was measured with a 30 m chain and the chain was 10 cm too long and b) The length of the chain was 30 m at the beginning and 30.10 m at the end of the work.	12	CO1	BL2															
2 (a)	The following bearings were taken while conducting a close traverse with a compass in a place where local attraction was suspected. <table border="1" style="margin-left: auto; margin-right: auto;"><thead><tr><th>Line</th><th>FB</th><th>BB</th></tr></thead><tbody><tr><td>AB</td><td>80°45'</td><td>260°00'</td></tr><tr><td>BC</td><td>130°30'</td><td>311°35'</td></tr><tr><td>CD</td><td>240°15'</td><td>60°15'</td></tr><tr><td>DA</td><td>290°30'</td><td>110°10'</td></tr></tbody></table> At what station do you suspect local attraction? Find the corrected bearings for local attraction and for declination of 1°30' W.	Line	FB	BB	AB	80°45'	260°00'	BC	130°30'	311°35'	CD	240°15'	60°15'	DA	290°30'	110°10'	12	CO2	BL3
Line	FB	BB																	
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(or)

2 (b)	Following are the bearings taken in a closed compass traverse. Compute the interior angles and correct them for observational error.	12	CO2	BL3																		
	<table border="1"> <thead> <tr> <th>Line</th> <th>FB</th> <th>BB</th> </tr> </thead> <tbody> <tr> <td>PQ</td> <td>S <math>37^{\circ}30'</math> E</td> <td>N <math>37^{\circ}30'</math> W</td> </tr> <tr> <td>QR</td> <td>S <math>43^{\circ}15'</math> W</td> <td>N <math>44^{\circ}15'</math> E</td> </tr> <tr> <td>RS</td> <td>N <math>73^{\circ}00'</math> W</td> <td>S <math>72^{\circ}15'</math> E</td> </tr> <tr> <td>ST</td> <td>N <math>12^{\circ}45'</math> E</td> <td>S <math>13^{\circ}15'</math> W</td> </tr> <tr> <td>TP</td> <td>N <math>60^{\circ}00'</math> E</td> <td>S <math>59^{\circ}00'</math> W</td> </tr> </tbody> </table>	Line	FB	BB	PQ	S $37^{\circ}30'$ E	N $37^{\circ}30'$ W	QR	S $43^{\circ}15'$ W	N $44^{\circ}15'$ E	RS	N $73^{\circ}00'$ W	S $72^{\circ}15'$ E	ST	N $12^{\circ}45'$ E	S $13^{\circ}15'$ W	TP	N $60^{\circ}00'$ E	S $59^{\circ}00'$ W			
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TP	N $60^{\circ}00'$ E	S $59^{\circ}00'$ W																				

3 (a) The following staff readings were observed successively with a level. The instrument is moved after third, sixth and eighth readings. Enter the reading in the level book and calculate R.L by Height of Instrument method and Rise and Fall method. If the first reading was taken at a B.M of 432.383m. The readings are 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 m respectively.

3 (b)	(i) Write the characteristics of contour lines. (ii) Define: Contour Interval, Horizontal Equivalent.	8	CO3	BL4
4 (a)	Elaborate on the methods of traversing.	12	CO4	BL5

4 (b)	The following angles were measured at a station O closing the horizon. Adjust the angles. $AOB = 83^{\circ} 42' 28.75''$ (wt - 3), $BOC = 102^{\circ} 15' 43.26''$ (wt - 2), $COD = 94^{\circ} 38' 27.22''$ (wt - 4), $DOA = 79^{\circ} 23' 23.77''$ (wt - 2).	12	CO4	BL5
5 (a)	Describe the classification of surveying.	12	CO4	BL4

5 (b)	Explain the working principles of EDM with suitable drawings.	12	CO4	BL5
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**NATIONAL INSTITUTE OF TECHNOLOGY PATNA**

**END SEMESTER EXAMINATION, May 2024**

**Session: 2023-24, Even Semester**

Program: **B. Tech**

Batch: **CE - II**

Semester: **2<sup>nd</sup>**

Time: **3 hr**

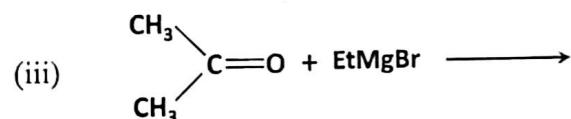
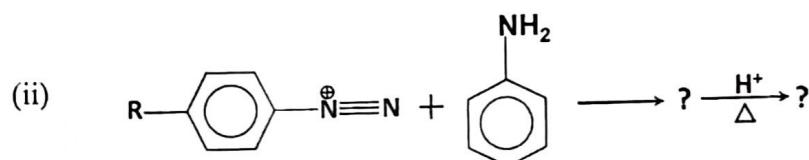
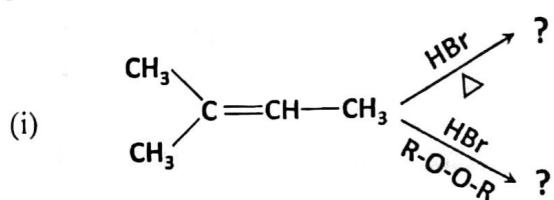
Full Marks: **60**

Subject Code: **CH23101**

Subject Name: **Engineering Chemistry**

*Answer all questions. Symbols and abbreviations have their usual meanings.*

1. Explain the outcome of the following reactions with appropriate mechanism: [10]



2. (a) The emf of a cell with a hydrogen electrode (not the std. electrode) coupled with reference calomel electrode ( $E_{\text{Calomel}} = 0.2415$  V) was found to be 0.4188 V at 298 K (pressure of  $\text{H}_2 = 1$  atm). What is the pH of the solution? [3]

(b) The  $\text{Cu}^{2+}/\text{Cu}^+$  redox system has an  $E^\theta$  value of +0.15 V, and under normal condition the reduction of  $\text{Cu}^{2+}$  is not possible by  $\text{I}^-$  ( $E_{\text{I}_2/\text{I}^-}^\theta = 0.54$  V). However, since  $\text{CuI}$  is sparingly soluble ( $K_s = 10^{-12}$ ), this becomes possible. How? [4]

3. (a) Discuss the MO picture of CO and HCl. Calculate the bond order in both cases and explain the  $\pi$  bonding and antibonding orbital pictures for CO. [7]

(b)  $\text{B}_2$  and  $\text{O}_2$  are both paramagnetic, explain how? [3]

(c) Using simple quantum mechanical formulation of Valence Bond Theory (VBT) deduce a suitable wave function for  $\text{H}_2$  ( $\psi_{\text{VBT}}$ ). Now show that Molecular Orbital theory (MOT) yields ( $\psi_{\text{MOT}}$ ) the same result for  $\text{H}_2$  molecule. [6]

4. (a)  $\text{NiCl}_4^{2-}$  is tetrahedral but  $\text{Ni}(\text{CN})_4^{2-}$  is square planar and so is  $\text{PtCl}_4^{2-}$ . Explain the above with crystal field theory. [4]

(b) Show the  $d$ -orbitals' splitting in octahedral, tetrahedral and square planar crystal field. Explain how the  $d$ -orbitals' splitting in square planar complex can be understood from the octahedral crystal field? [7]

(c) Explain why? [6]

(i) Tetrahedral complexes are almost always high spin complex.

(ii)  $[\text{Ni}(\text{NH}_3)_4]^{2+}$  is paramagnetic but  $[\text{Pt}(\text{NH}_3)_4]^{2+}$  is diamagnetic.

(iii)  $\text{CrCl}_6^{3-}$  is high spin complex but  $\text{Cr}(\text{CO})_6^{3+}$  is low spin complex.

5. (a) The percentage composition of a sample of coal by weight was found to be: C = 75%, H = 5%, O = 12%, N = 3%, S = 2%, rest = Ash. If 50% excess air (having 23% oxygen) is supplied to ensure complete combustion, how much air is required for complete combustion of 1 kg coal (in kg)? Now calculate the percentage composition of dry product of combustion (w/w). [6]

Or

(a) Describe Bomb calorimeter and its working principle. Why it can only measure HCV? [6]

(b) How engine knocking occurs? What is octane number? Explain. [4]

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