University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 2nd Semester

Course Title: Engineering Hydrology | Course Code: CE 363
Time: 1 hour | Credit Hour: 3 | Full Marks: 40

Answer all the questions

QUESTION 1 [10 MARKS]

a. Define hydrologic budget/water budget. Link the components of hydrologic cycle and continuity equation to find water budget equation. [5]

b. Discuss the necessity of measuring rainfall annually and hourly. [5]

QUESTION 2 [10 MARKS]

On a winter day, the automated weather station in Dhaka recorded the following values: The average air temperature was 59 °F, the average wind speed was 6 miles/hr and the average relative humidity was 60%. Estimate evaporation using the Harbeck and Meyers (1970) Formula. Consider b = 0.0119 cm-sec/m.mb-day. [10]

QUESTION 3 [10 MARKS]

The daily streamflow data for a river, at a site having a drainage area of 7000 km^2 are given in table below. Separate the baseflow from the direct runoff hydrograph (DRH) by 2nd Method of the Arbitrary Approach. Determine the runoff volume and equivalent depth of the direct runoff. [10]

Time (days)	Flow (m^3/s)
1	170
2	168
3	550
4	1180
6	860
7	660
8	520
9	390
10	285
12	225
13	190
14	140
15	135

QUESTION 4 [10 MARKS]

A 60 acre watershed has a total runoff volume of 160,000 ft^3 after the storm recorded as shown in the table below. What is the phi-index for this watershed? Give the first 2 trails. [10]

Time (hr)	Precipitation (in/hr)
1	0.15
2	0.25
3	0.85
4	1.45
6	1.35
7	0.81
8	0.55
9	0.3
10	0.1

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2024
Program: B. Sc. Engineering (Civil)
3rd Year 2nd Semester

Course Title: Environment Engineering II Credit hour:3.00 Course Code: CE 333
Time-1hour Full marks: 40

PART A

There are two questions. Answer all the questions. ***(10*2 = 20)***

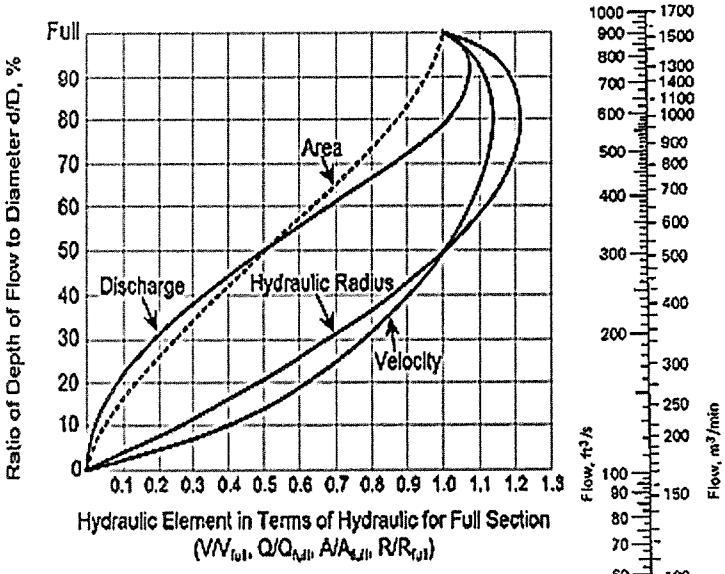
[Assume reasonable data if any]

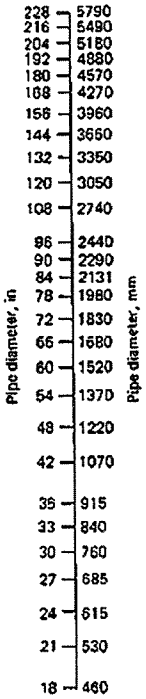
QUESTION 1 [10 MARKS]

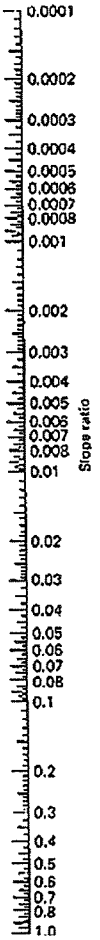
In a rural area, water supply is limited, that's why a pit latrine is installed by the local authority, but children and women still face several diseases. Then, the local authorities decided to install a new sanitation system that removes odors and has a longer life. Select an appropriate sanitation technology for that area and justify your answer. Also, explain why your selected onsite sanitation technology is better than other technologies. **[10]**

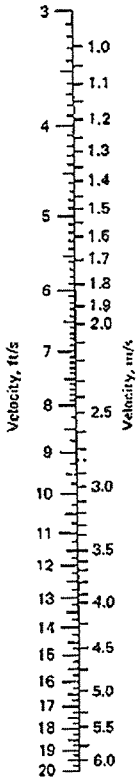
QUESTION 2 [10 MARKS] **[10]**

A 915 mm (36 inches) sewer is laid in a slope of 0.003; design the depth of flow and velocity when the flow is 9.5 m^3/ min. Necessary graph and Nomograph for the solution of Manning's equation, for full flowing circular pipes are attached below.









PART B

There are <u>two</u> questions. Answer all the questions. *<u>(10*2 = 20)</u>*

[Assume reasonable data if any]

<u>QUESTION 3 [10 MARKS]</u>

Design (a) rectangular sedimentation tank, and (b) circular tank for wastewater treatment employing the following dataset: **[10]**

- Average flow rate, Q_{av}=20,000 m^3/d.
- Peak hourly flow rate, Q_p=40,000 m^3/d.
- The specific gravity of the particles to be removed, s=1.25.
- Diameter of the particles, d=100 μm.
- Darcy-Weisbach fraction factor, f=0.025.
- Scouring material constant, k=0.05.

Use the following formula and table if required.

$$V_H = \left[\frac{8k(s-1)gd}{f}\right]^{1/2} \qquad \text{BOD or TSS removal} = \frac{t}{a+bt}$$

Table. Typical empirical values for sedimentation tank design.

Typical empirical values		
Pollutant	*a*	*b*
BOD	0.018	0.020
TSS	0.0075	0.014

<u>QUESTION 4 [10 MARKS]</u> **[10]**

Explain the advantages and disadvantages of fungi and their competition with bacteria in a biological reactor.

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 2nd Semester

Course Title: Principles of Management | Course Code: IMG 301
Time: 1 hour | Credit Hour: 2.00 | Full Marks: 20

I. **Answer Any Four of the following questions.**
II. **You are advised to submit your question paper along with the answer script.**

QUESTION 1 [5 MARKS] [CO1/PO2/C3]

Differentiate between Henry Mintzberg's three categories of managerial roles (Interpersonal, Informational, and Decisional).

QUESTION 2 [5 MARKS] [CO2/PO4/C4]

Discuss about different types of management style with relevant examples.

QUESTION 3 [5 MARKS] [CO4/PO4/C4]

Imagine an employee discovers unethical practice within the organization where he is working. He faces a dilemma of whether to report the misconduct, risking potential backlash on himself or letting the unethical practice continue. Which sort of ethical dilemma is he facing and how do you think he should respond to this ethical dilemma?

QUESTION 4 [5 MARKS] [CO1/PO3/C5]

Which of the three parochial behaviors—ethnocentric, polycentric, and geocentric—do you consider the best and the worst, and why? Justify your answer.

QUESTION 5 [2.5 x 2=5 MARKS] [CO2/PO3/C5]

Imagine that, you're the manager of a software company that sells a productivity tool. In October, you sold the software for $80 per license. In November, due to increasing production costs and market trends, you decide to raise the price to $100. After the price increase, your sales are moderate, but you've received many complaints from long-time customers who think the software is now too expensive. Now, you need to decide whether to keep the new price or revert to the old price. You are confused as you have already invested in marketing for the price increase, and your subordinates are conforming that the new price will result in long-term profit growth. Initially you were very confident about the price hike, but now you're unsure about the customer complaints.

What is the percentage increase in price here? Also identify the decision-making errors which have occurred in the given scenario?

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 2nd Semester

Course Title: Structural Engineering I — Course Code: CE 311
Time: 1 hour — Credit Hour: 3.00 — Full Marks: 40

Answer all the questions

PART-A

QUESTION 1 [8 MARKS]

Analyze the truss shown in **Figure 1** and calculate the vertical deflection of **D or A** (EI=constant). CO1/PO2/C4 [08]

QUESTION 2 [12 MARKS]

Analyze the frame shown in **Figure 2** and calculate the horizontal deflection at **K** (EI=constant). CO1/PO2/C4 [12]

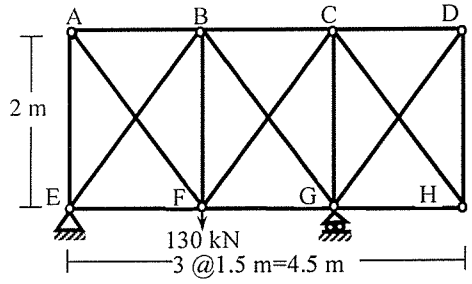


Figure 1

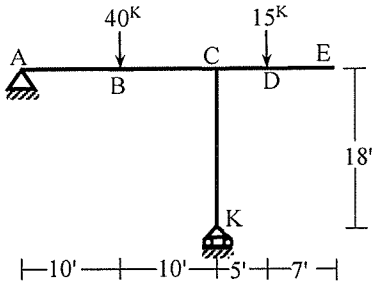


Figure 2

Part-B

QUESTION 3 [13 MARKS]

Bending Moment Diagram of Columns of a two-story frame shown in **Figure 3**. Analyze the frame using the Portal Method to:
(i) calculate applied loads P_1 and P_2 **(ii)** draw the column shear force and axial force diagrams **(iii)** draw the beam shear force and bending moment diagrams. CO1/PO2/C4 [13]

QUESTION 4 [07 MARKS]

Analyze the truss and determine the member forces of the statically indeterminate truss shown in **Figure 4** assuming, diagonal members take an equal share of the sectional shear force.

CO1/PO2/C4 **[07]**

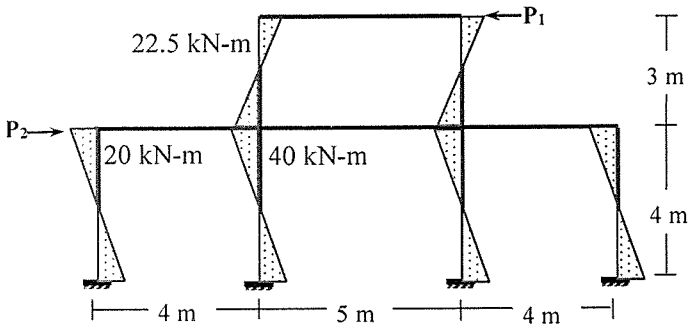


Figure 3

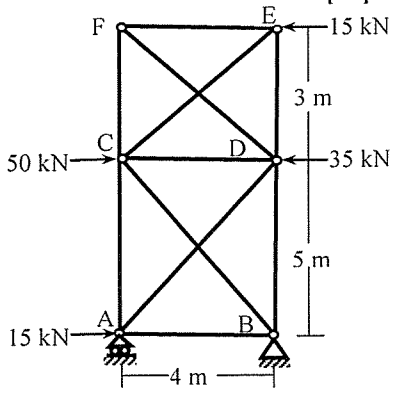
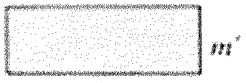
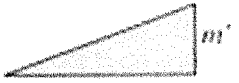
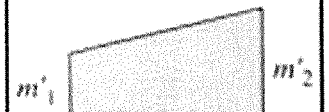
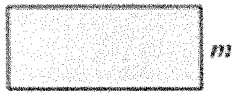
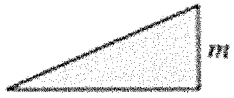
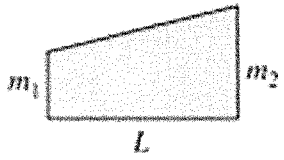
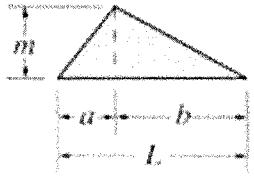
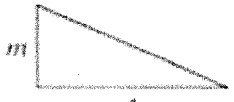


Figure 4

Table for Evaluating $\int_0^L m\, m'\, dx$

$\int_0^L m\, m'\, dx$				
	$mm'L$	$\frac{1}{2}mm'L$	$\frac{1}{2}m(m'_1 + m'_2)L$	$\frac{2}{3}mm'L$
	$\frac{1}{2}mm'L$	$\frac{1}{3}mm'L$	$\frac{1}{6}m(m'_1 + 2m'_2)L$	$\frac{5}{12}mm'L$
	$\frac{1}{2}m'(m_1 + m_2)L$	$\frac{1}{6}m'(m_1 + 2m_2)L$	$\frac{1}{6}[m'_1(2m_1 + m_2) + m'_2(m_1 + 2m_2)]L$	$\frac{1}{12}[m'(3m_1 + 5m_2)]L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'(L + a)$	$\frac{1}{6}m[m'_1(L + b) + m_2(L + a)]$	$\frac{1}{12}mm'\left(3 + \frac{3a}{L} - \frac{a^2}{L^2}\right)L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'L$	$\frac{1}{6}m(2m'_1 + m'_2)L$	$\frac{1}{4}mm'L$

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 2nd Semester

Course Title: Design of Concrete Structures II | Course Code: CE 317
Time: 1 hour | Credit Hour: 3.00 | Full Marks: 60

Answer all the questions

QUESTION 1 [30 MARKS]

a. The side panel of beam supported slab (as shown in **Figure 1**) is subjected to floor live load of 2 kN/m^2. Thickness of the slab is 200 mm. Apply the design concept to obtain the reinforcement of slab for **short span support moment** (negative) only. Assume required data to design the slab. Coefficients of the slab for the negative moment at the continuous support is 0.055. [15]

b. A 10-storeyed office building is constructed with **flat slab** as shown in **Figure 2;** live load of the office is 2.4 kN/m^2. Thickness of the slab could be considered as 240 mm. The concrete strength (f_c') is 25 N/mm^2. Positive and negative moment coefficients of the panel are 0.35 and 0.65, respectively. Design the **Slab S5** for **mid-span moment** of **long span column strip** only. [15]

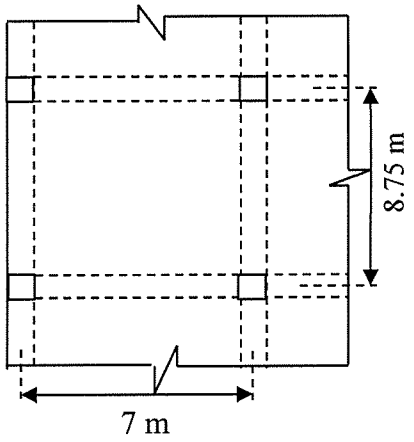


Figure 1. Side slab panel

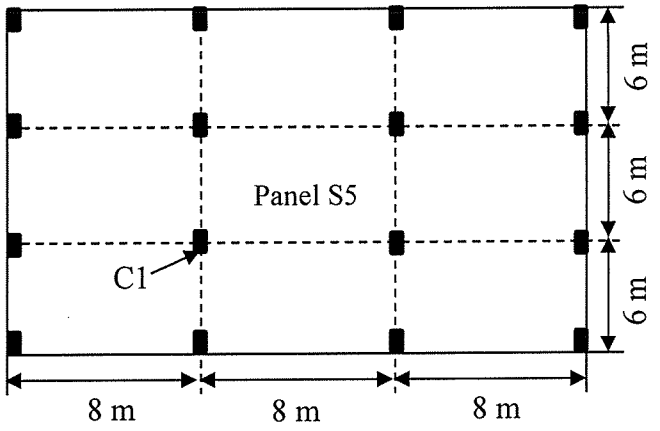


Figure 2. Flat slab floor plan

QUESTION 2 [18 MARKS]

Design the **ground floor** column of **"C1"** (shown in **Figure 2**) of the 10-storeyed office building stated in **Question 1 (b)**. The structure is constructed as **flat slab**. The column is subjected to 700 kN-m uni-axial moment due to lateral load. Design the column considering safety, environment and societal requirements. Dimension of the column is required to be minimized as much as possible considering all the provisions of BNBC 2020. The column design chart is shown in Appendix (**Figure A1**). [18]

QUESTION 3 [12 MARKS]

The thickness of flat slab of **Question 1(b)** is required to be minimized. Develop the punching shear resisting formulation of the column. Propose a solution for the possible **of minimal slab thickness**. Justify your proposal in accordance to all options of deflection and punching shear requirements of BNBC 2020 considering safety and environmental issues. [12]

APPENDIX

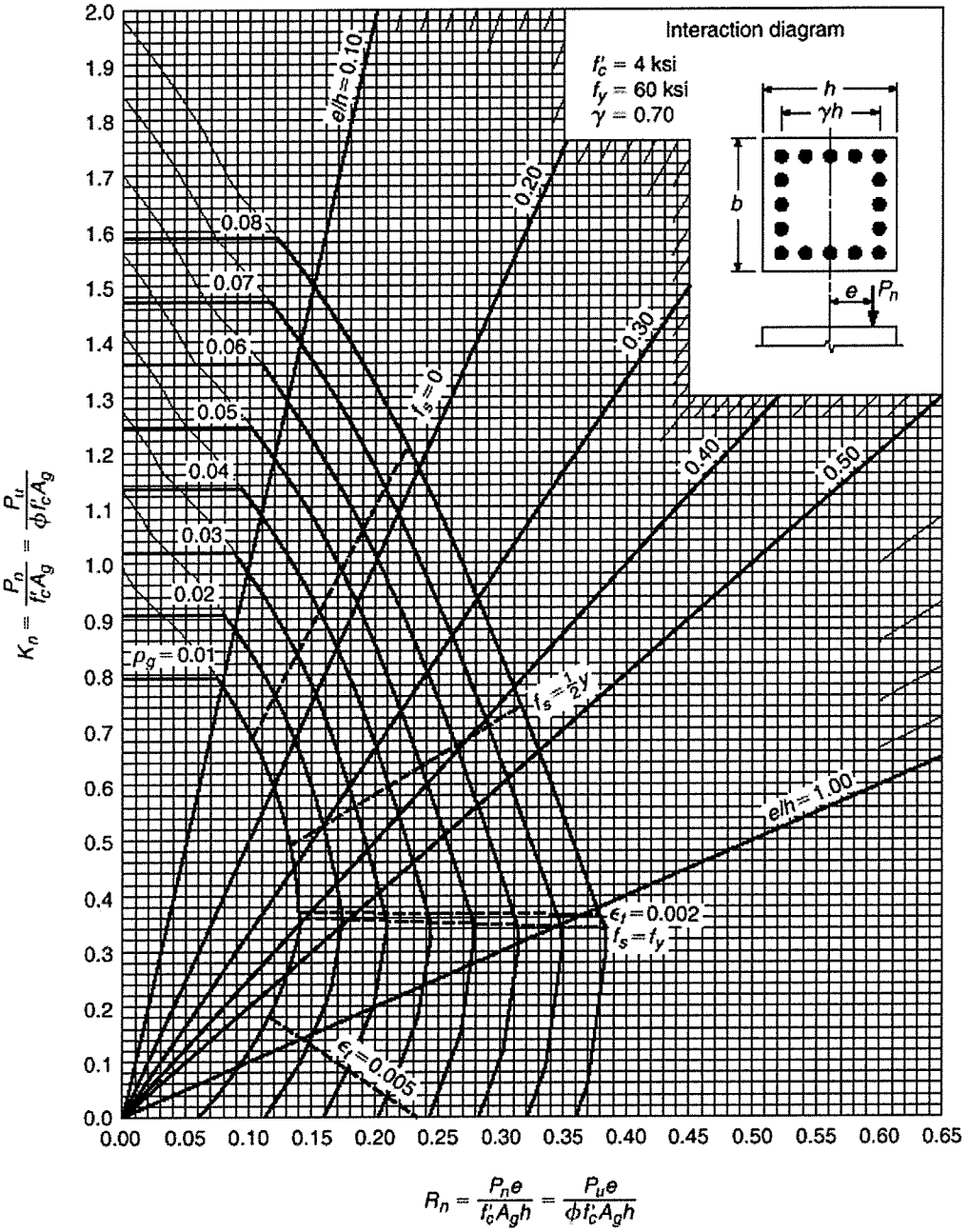


Figure A1. Column Design Chart

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 2nd Semester

Course Title: Transportation Engineering I | Credit Hour: 3.00 | Course Code: CE 351
Time: 1 hour | Full Marks: 60

Answer all the questions

1. a) Define Multimodal Transportation and discuss its benefits and constraints in urban transportation systems with relevant examples. [8]
   b) Explain why traffic engineering is essential nowadays. Describe the traffic engineering tools used for ensuring traffic safety. [3+5]

2. a) Discuss the concept of Road Hierarchy in transportation system by showing a detailed schematic diagram. [8]
   b) Identify the 'Green Road' in front of 'University of Asia Pacific, Dhaka' based on Roadway Classification system by mentioning every types. [6]

3. a) Explain different types of vehicular maneuvers with diagram. [6]

   b) Determine the conflict points of a 4-leg intersection having following configuration; Road A = 3-lane 2-way road and Road B = 2-lane 2-way road. [8]

4. a) Discuss the different factors influencing road users travel demand. [6]

   b) Design the lighting layout of a road will be constructed in Purbachol highway. The road configuration is two-way road with 2 lanes in each direction. The roadway width is 65 ft having 1ft curb on both sides. The mounting height is 45 ft, surface reflectance is 18% and maintenance factor is 0.55. Consider, Tungsten bulb. The measured traffic volume of that road in Day-time (both direction) = 500 vph and Night-time (both direction) = 2000 vph. Refer to the annexure (Table 1-3, Figure 1) for necessary data. [10]

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 2nd Semester

Course Title: Structural Engineering I — Course Code: CE 311
Time: 1 hour — Credit Hour: 3.00 — Full Marks: 40

Answer all the questions

PART-A

QUESTION 1 [8 MARKS]

Analyze the truss shown in **Figure 1** and calculate the vertical deflection of **D or A** (EI=constant). CO1/PO2/C4 [08]

QUESTION 2 [12 MARKS]

Analyze the frame shown in **Figure 2** and calculate the horizontal deflection at **K** (EI=constant). CO1/PO2/C4 [12]

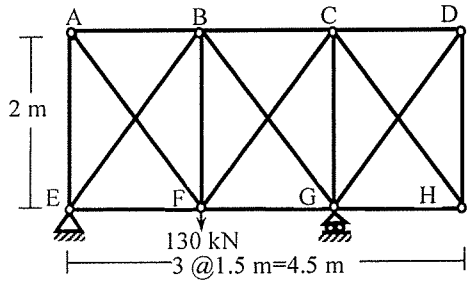


Figure 1

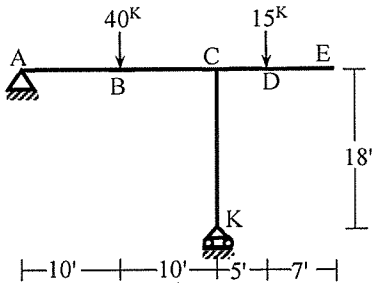


Figure 2

Part-B

QUESTION 3 [13 MARKS]

Bending Moment Diagram of Columns of a two-story frame shown in **Figure 3**. Analyze the frame using the Portal Method to:
(i) calculate applied loads P_1 and P_2 **(ii)** draw the column shear force and axial force diagrams **(iii)** draw the beam shear force and bending moment diagrams. CO1/PO2/C4 [13]

QUESTION 4 [07 MARKS]

Analyze the truss and determine the member forces of the statically indeterminate truss shown in **Figure 4** assuming, diagonal members take an equal share of the sectional shear force.

CO1/PO2/C4 **[07]**

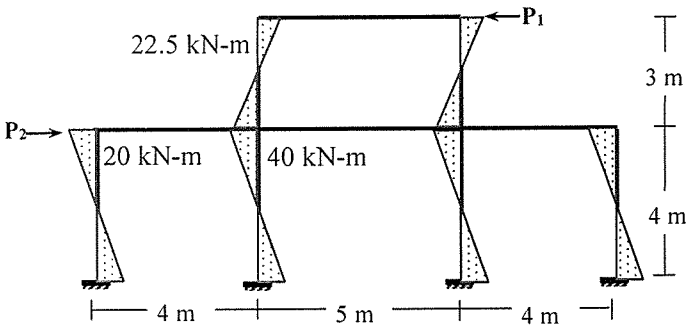


Figure 3

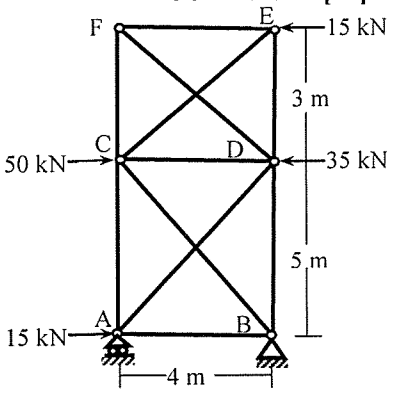
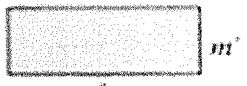
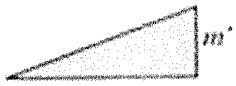
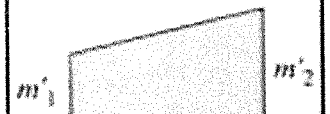
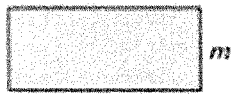
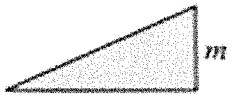
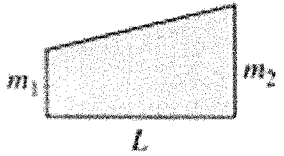
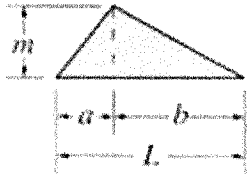
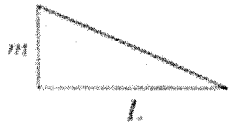


Figure 4

Table for Evaluating $\int_0^L m\, m'\, dx$

$\int_0^L m\, m'\, dx$				
	$mm'L$	$\frac{1}{2}mm'L$	$\frac{1}{2}m(m'_1 + m'_2)L$	$\frac{2}{3}mm'L$
	$\frac{1}{2}mm'L$	$\frac{1}{3}mm'L$	$\frac{1}{6}m(m'_1 + 2m'_2)L$	$\frac{5}{12}mm'L$
	$\frac{1}{2}m'(m_1 + m_2)L$	$\frac{1}{6}m'(m_1 + 2m_2)L$	$\frac{1}{6}[m'_1(2m_1 + m_2) + m'_2(m_1 + 2m_2)]L$	$\frac{1}{12}[m'(3m_1 + 5m_2)]L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'(L + a)$	$\frac{1}{6}m[m'_1(L + b) + m_2(L + a)]$	$\frac{1}{12}mm'\left(3 + \frac{3a}{L} - \frac{a^2}{L^2}\right)L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'L$	$\frac{1}{6}m(2m'_1 + m'_2)L$	$\frac{1}{4}mm'L$