

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Semester Final Examination (Fall 2017)**  
**Program: B.Sc. (Honours) in Civil Engineering**  
**Year: 1st Semester: 1st**

Course Code: HSS 101  
Time: 3 hours

Course Title: English Language I  
Full Marks: 50

**1. Read the following passage and answer the questions: 3**

The first English attempts to colonize North America were controlled by individuals rather than companies. Sir Humphrey Gilbert was the first Englishman to send colonists to the New World. His initial expedition, which sailed in 1578 with a patent granted by Queen Elizabeth was defeated by the Spanish. A second attempt ended in disaster in 1583, when Gilbert and his ship were lost in a storm. In the following year, Gilbert's half brother, Sir Walter Raleigh, having obtained a renewal of the patent, sponsored an expedition that explored the coast of the region that he named Virginia. Under Raleigh's direction efforts were then made to establish a colony on Roanoke Island in 1585 and 1587. The survivors of the first settlement on Roanoke returned to England in 1586, but the second group of colonists disappeared without leaving a trace. The failure of the Gilbert and Raleigh ventures made it clear that the tasks they had undertaken were too big for any one colonizer. Within a short time the trading company had supplanted the individual promoter of colonization.

**I. Which of the following would be the most appropriate title for the passage?**

- (A) The Regulation of Trading Companies
- (B) British - Spanish Rivalry in the New World
- (C) Early Attempts at Colonizing North America
- (D) Royal Patents Issued in the 16th Century

**II. When did Sir Walter Raleigh's initial expedition set out for North America?**

- (A) 1577
- (B) 1579
- (C) 1582
- (D) 1584

**III. According to the passage, the first English settlement on Roanoke Island was established in**

- (A) 1578
- (B) 1583
- (C) 1585
- (D) 1587

**2. Write a review of Jerome K Jerome's "Three Men in a Boat" (120-150 words) 7**

**3. Suppose you are Badrul Islam and you have completed your B.Sc. in Civil Engineering from the University of Asia Pacific with a CGPA of 3.90 out of 4.00. You are planning to go to abroad for pursuing your M.Sc. in Civil Engineering. Write an inquiry letter to Dr. Susan Braehler, the Academic Coordinator, University of Heidelberg, Germany asking her for information concerning your admission. (120-150 words) 7**

**4. The Social Awareness Club of the University of Asia Pacific arranged a day long blood donation program on January 31, 2018 at the university plaza. Write a report on it. (120-150 words) 7**



5. Analyse the picture based on the instructions given in the class. (120-150 words)

7



6. Write a paragraph of 120-150 words on **A Life-changing Experience**

7

7. Write an essay on any one of the following topics (250 words)

12

a) Gender discrimination in Bangladesh

b) Social Networking Sites are making us unsocial in real life



**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Final Examination Fall 2017**  
**Program: B.Sc in Civil Engineering**

Course Title: Physics  
Time: 3.00 Hours

Course Code: PHY-101  
Full Mark: 150

*N.B-* There are **Eight** Questions. Answer any **Six**. All questions are of equal value. Figures in the right margin indicate marks.

1. (a) Derive the relation  $v=\sqrt{k}$  from the general equation of a simple harmonic wave and find out the relation between particle velocity and wave velocity of sound. [15]
- (b) When a simple harmonic wave is propagated through a medium, the displacement of a particle in cm at any instant of time is given by  $y=10 \sin \frac{2\pi}{100}(36000t-20)$ . Calculate the amplitude of the vibrating particle, wave velocity, wave length, frequency and time period. [10]
2. (a) Define infrasonic and ultrasonic wave of sound. Explain Lissajous' figures. Prove that  $y = A \sin (\omega t + \phi)$  from the composition of two simple motions in a straight line. [15]
- (b) Two simple harmonic motions acting simultaneously on a particle are given by the equations  $y_1= \sin (\omega t+\pi/3)$  and  $y_2= 3 \sin \omega t$ . Find the equation of the resultant vibration. [10]
3. (a) What is called acoustics? Draw and explain sound distribution system and write down requisites for good acoustics in an auditorium. [15]
- (b) An ultrasonic beam is used to determine the thickness of a steel plate. It was noticed that the difference in two adjacent harmonic frequencies is 50 kilo hertz. The velocity of sound in steel is 5000 m/sec. Calculate thickness of the steel plate. [10]
4. (a) Write down two postulates of the kinetic theory of gases. Prove that  $C= \sqrt{\frac{3P}{\rho}}$ , where the terms have their usual meanings. [15]
- (b) At what Celsius temperature will oxygen molecules have the same root mean square velocity as that of hydrogen molecules at  $-100^{\circ}\text{C}$ ? [10]

*Turn over*



5. (a) Define thermal equilibrium state and Zeroth law of thermodynamics. State and explain Newton's law of cooling. [15]
- (b) A liquid takes 4 minutes to cool from  $70^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ . How much time will it take to cool from  $50^{\circ}\text{C}$  to  $40^{\circ}\text{C}$ ? The temperature of the surrounding is  $25^{\circ}\text{C}$ . Newton's law of cooling is applicable throughout the process. [10]
6. (a) State and explain Carnot's cycle and find out the efficiency of Carnot's reversible engine. [15]
- (b) A Carnot's engine is operated between two reservoirs at temperature of 450 K and 350 K. If the engine receives 1000 calories of heat from the source in each cycle, calculate the amount of heat rejected to the sink in each cycle. Calculate the efficiency of the engine and the work done by the engine in each cycle. ( 1 calorie =4.2 joules) [10]
7. (a) How can you produce Newton's rings using a monochromatic light? Prove that  $r^2=(2n-1)\lambda R/2$  for Newton's bright ring, where the terms have their usual meanings. [15]
- (b) In a Newton's rings experiment the diameter of the 15 th ring was found to be 0.590 cm and that of the 5 th ring was 0.336 cm. If the radius of the plano-convex lens is 100 cm, calculate the wave length of light used. [10]
8. (a) State and explain Malus law and Brewster law for a polarized light. [20]
- (b) Calculate the thickness of a half wave plate of quartz for a wave length of  $5000\text{\AA}$ . Here  $\mu_E=1.553$  and  $\mu_0=1.544$ . [05]



**University of Asia Pacific**  
**Department of Basic Sciences & Humanities**  
**Final Examination, Fall-2017**  
**Program: B.Sc. in Civil Engineering**

Course Title: Mathematics I

Time: 3.00 Hour

Course Code: MTH 101

Full Marks: 150

There are **Eight** questions. Answer any **six**. All questions are of equal values, indicated in the right margin.

1. (a) Find  $\lim_{x \rightarrow 3} f(x)$ , if it exists, where  $f(x) = \begin{cases} x - 1, & x \leq 3 \\ 3x - 7, & x > 3 \end{cases}$  5
- (b) Define Continuity of a function. Examine Continuity and Differentiability of  $f(x)$  at  $x = 1$ , where  $f(x) = \begin{cases} x^2 + 1, & x \leq 1 \\ 2x, & x > 1 \end{cases}$  20
  
2. (a) State Euler's theorem on homogeneous function. If  $u = \tan^{-1} \frac{x^2 + y^2}{x + y}$ , prove that 10

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \sin 2u.$$
- (b) Evaluate:  $\lim_{x \rightarrow 0} (\sin x)^x$  7
- (c) Find centre of curvature at (4, 4) of  $xy = 16$ . 8
  
3. (a) State Leibnitz's Theorem. If  $y = \tan^{-1} x$ , then show that 12

$$(1 + x^2)y_{n+2} + 2(n+1)xy_{n+1} + (n^2 + n)y_n = 0$$
- (b) Find  $f_{xx}$ ,  $f_{xy}$  and  $f_{yy}$  for function  $f = e^{x^2+xy+y^2} \sin x$  13
  
4. (a) Expand the function  $\ln(x+h)$  in power of  $h$  with remainders  $R_n$  in Lagrange's and Cauchy's form. 15



(b) State Mean value Theorem. Verify Mean Value Theorem for the function  $f(x) = x^3 + 1$  over  $[1, 2]$ . 10

5. Evaluate the following integrals: 25

(i)  $\int e^x \sin x dx$       (ii)  $\int_1^2 \frac{(1+\log x)}{x} dx$       (iii)  $\int \frac{\sin x + \operatorname{cosec} x}{5 \tan x} dx$       (iv)  $\int_0^1 x e^{-3x} dx$

6. (a) Evaluate  $\iint_R (x^3 + 4y) dy dx$  over the region R enclosed by lines  $y = 2x$ ,  $y = x^2$ . 15

(b) Establish a formula of reduction for  $\int \cos^n x dx$  10

7. (a) Define improper integrals. Evaluate  $\int_1^3 \frac{x dx}{(x^2 - 1)^{2/3}}$ . 15

(b) Evaluate the improper integral  $\int_0^\infty \frac{x dx}{x^4 + 1}$  10

8. (a) Define Gamma and Beta functions. 20

Show that  $\int_0^{\pi/2} \sin^p \theta \cos^q \theta d\theta = \frac{\Gamma(\frac{p+1}{2}) \Gamma(\frac{q+1}{2})}{2\Gamma(\frac{p+q+2}{2})}$ . Where  $p + 1 > 0, q + 1 > 0$ .

And prove that  $\int_0^{\pi/2} \sin^4 \theta \cos^6 \theta d\theta = \frac{3\pi}{512}$

(b) Evaluate  $\int_0^\infty e^{-y^2} y^5 dy$  5



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Fall 2017**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Engineering Mechanics I  
 Time: 3 hours

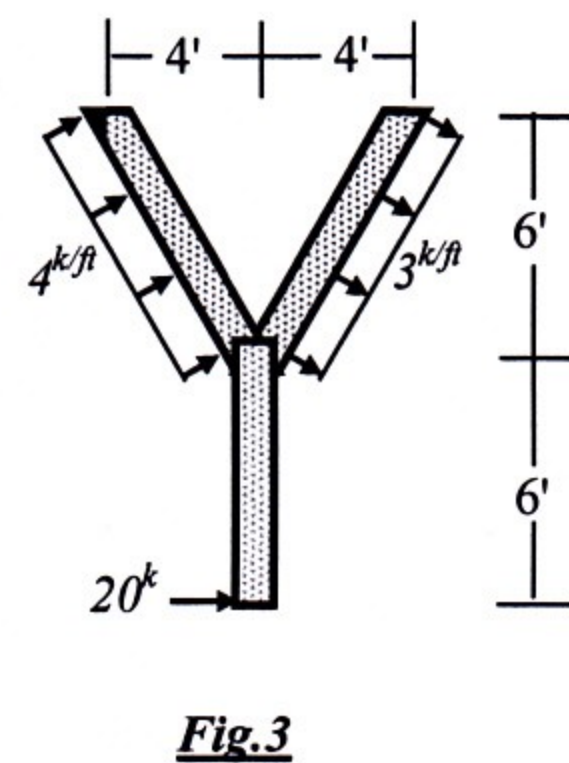
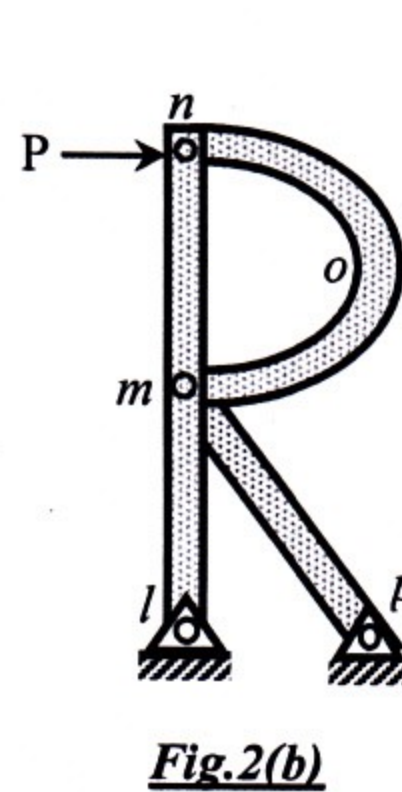
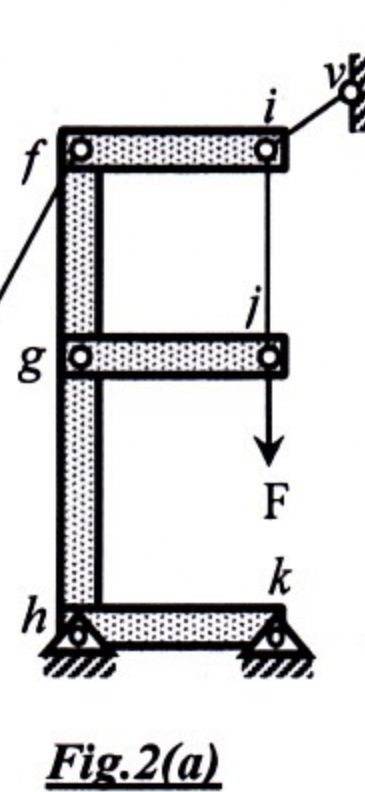
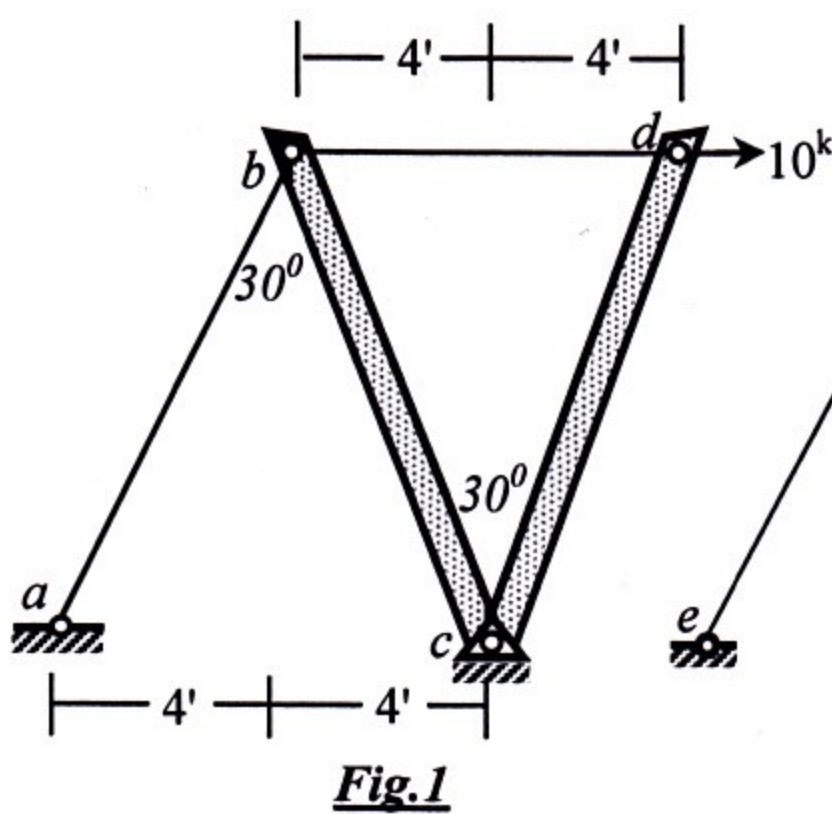
Credit Hours: 3.0

Course Code: CE 101  
 Full Marks: 100

**PART A**

Answer any 2 (two) from the following 3 (three) questions [10×2=20]

- In the structure loaded as shown in **Fig.1**, calculate the (i) reactions of supports *a* and *c* and (ii) force of members *bc* and *cd* (members are weightless).
- In the structures shown in **Fig.2(a, b)** draw free-body diagram (FBD) of  
 (a) Member *fgh, fi* and *gj*, Cable *ef* and Support *e* and *h* [**Fig.2(a)**]  
 (b) Member *lmn, mon, mp* and Support *l* [**Fig.2(b)**]

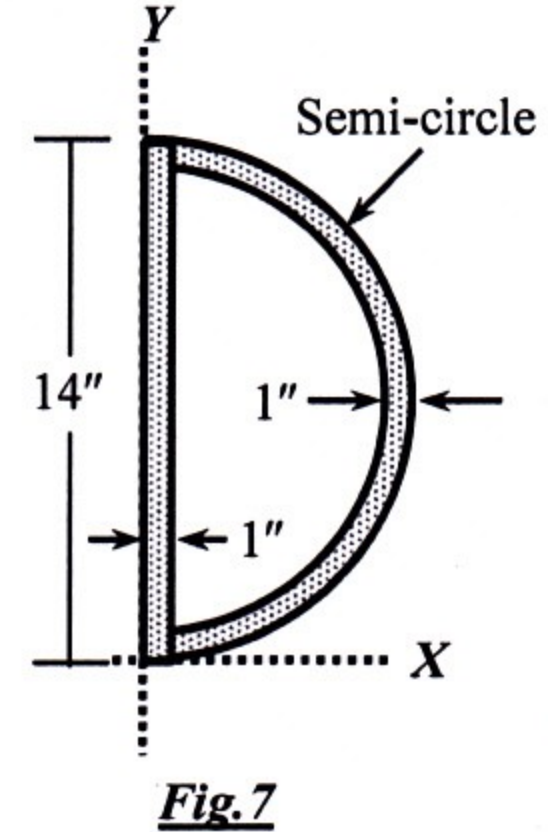
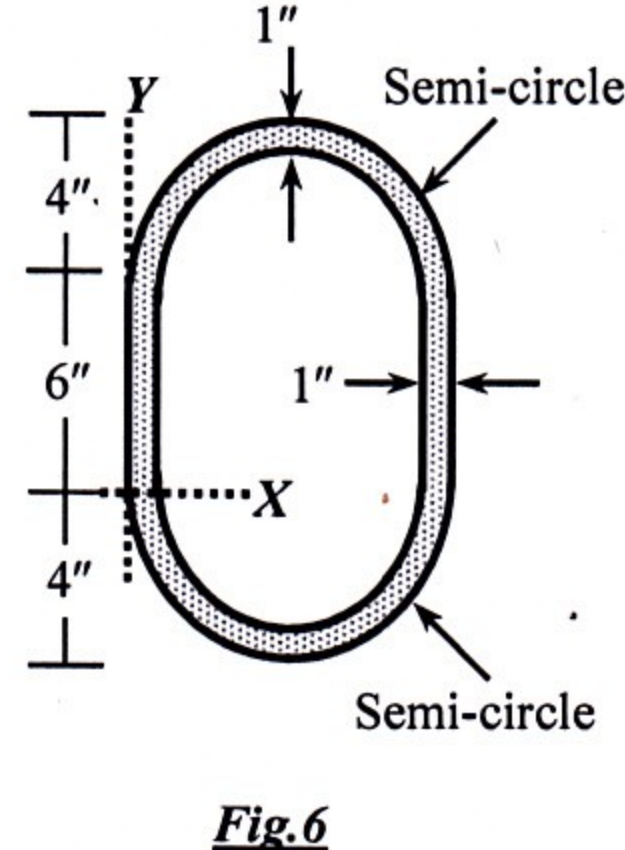
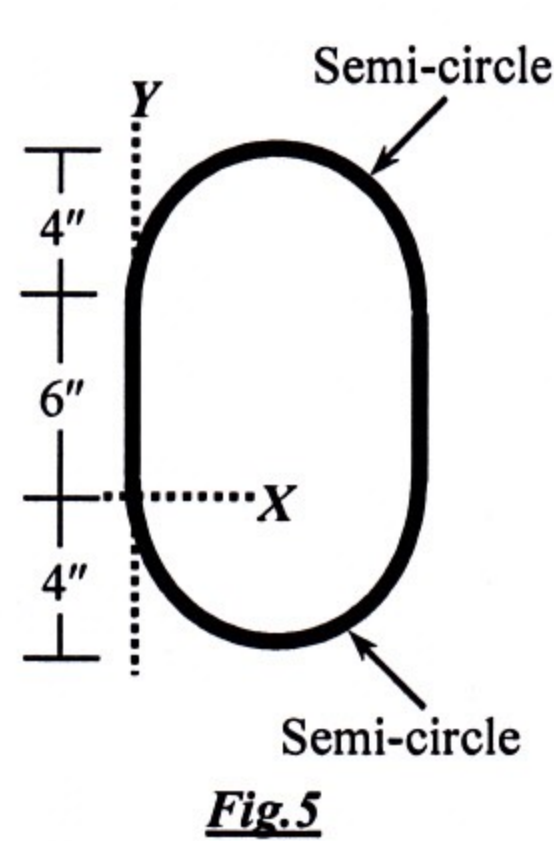
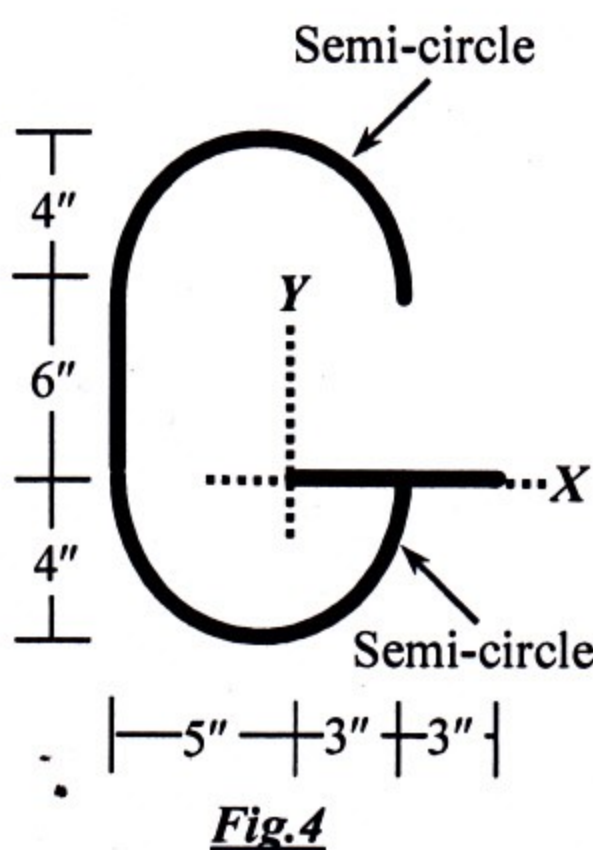


- Fig.3** shows a system of forces acting on a structure. Calculate the magnitude, direction and location of resultant of the forces.

**PART B**

Answer any 5 (five) from the following 7 (seven) questions [10×5=50]

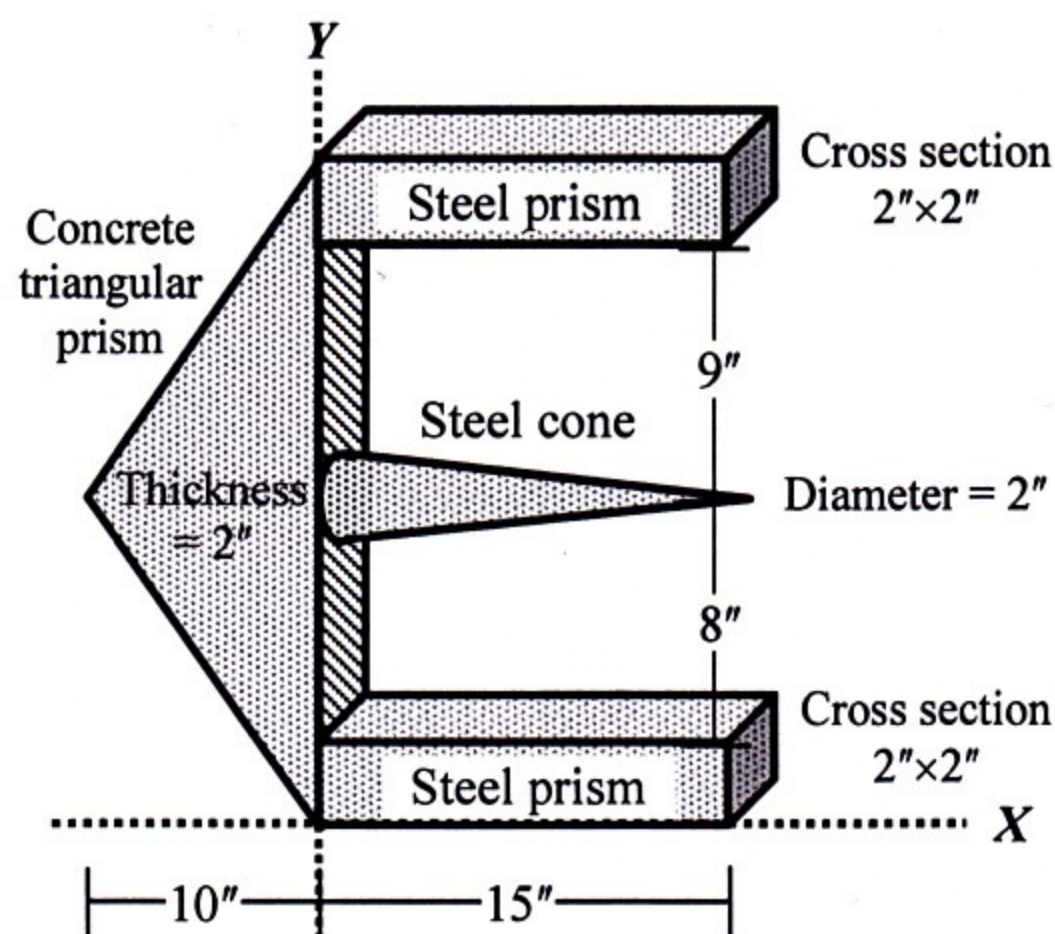
- Locate the centroid of the composite line with respect to given co-ordinate system as shown in **Fig.4**.



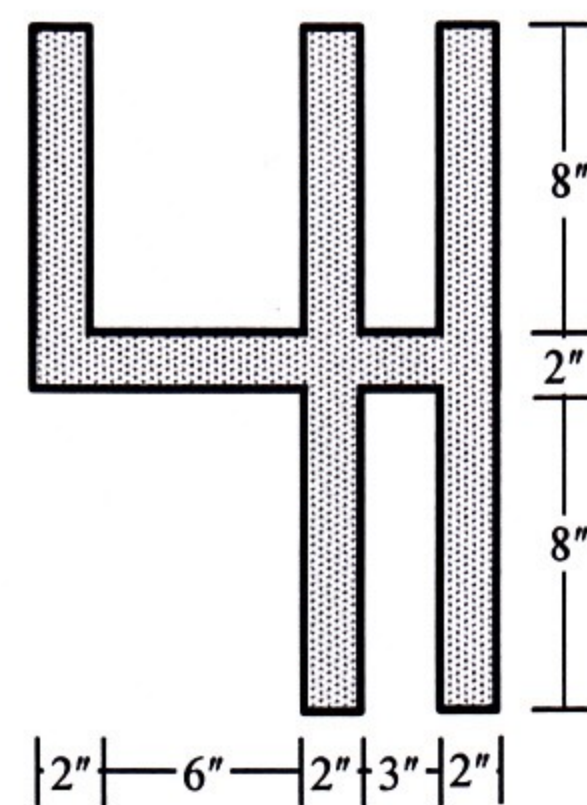
- Locate the centroid of the line with respect to given co-ordinate system by integration method as shown in **Fig.5**.



6. Compute moment of inertia  $I_x$ ,  $I_y$  and  $J$  of the shaded area as shown in **Fig.6** with respect to centroidal axes.
7. Locate the centroid of the composite area with respect to given co-ordinate system as shown in **Fig.7**.
8. Compute moment of inertia  $I_x$  of the shaded area by integration method as shown in **Fig.7** with respect to given co-ordinate system.
9. Locate the centroid of the composite weight with respect to given co-ordinate system as shown in **Fig.8** [Given: Unit weight of concrete,  $\gamma_{\text{concrete}} = 150 \text{ lb/ft}^3$ ; unit weight of steel,  $\gamma_{\text{steel}} = 490 \text{ lb/ft}^3$ ].



**Fig.8**



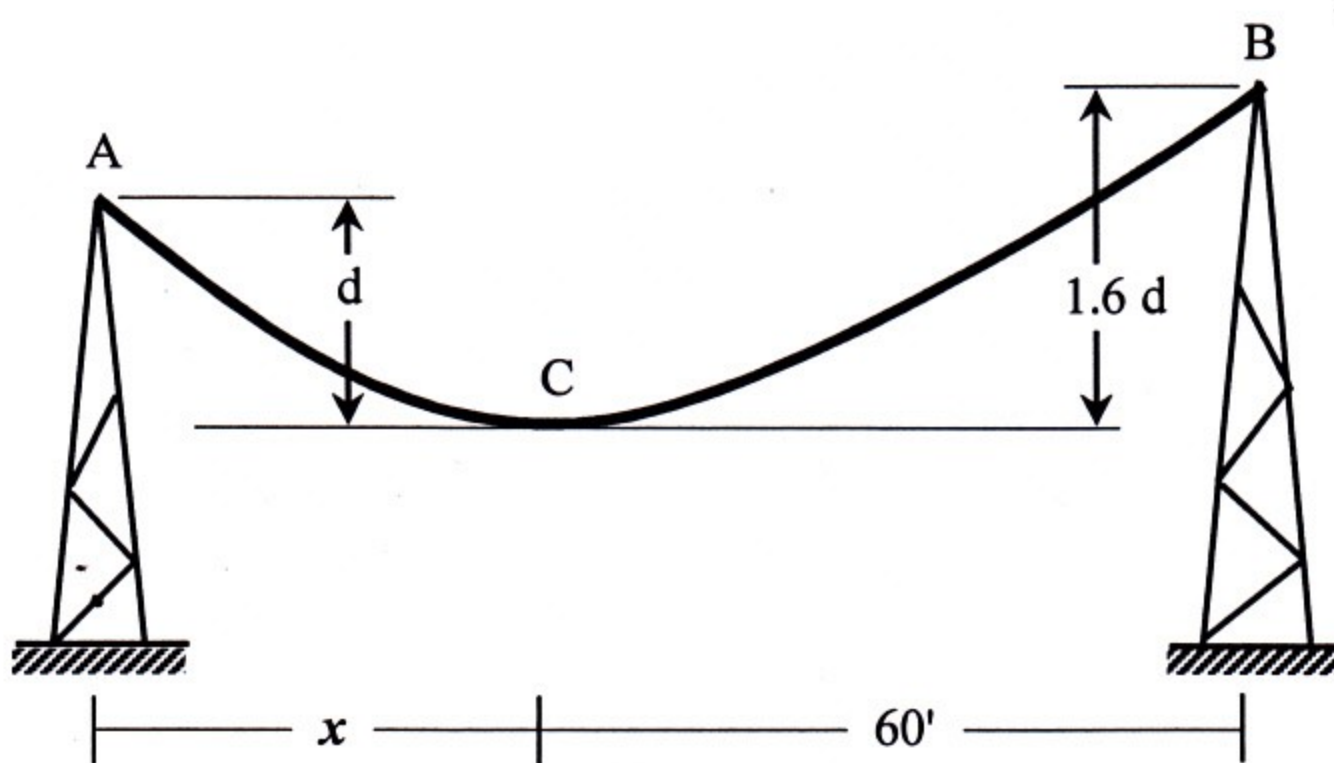
**Fig.9**

10. Compute product of inertia  $P_{xy}$ , minimum moment of inertia  $I_{min}$  and maximum moment of inertia  $I_{max}$  of the shaded area as shown in **Fig.9** [Given: Centroid:  $x = 8.88''$ ,  $y = 9.73''$ , moment of inertia  $\bar{I}_x = 2178.51 \text{ in}^4$ ,  $\bar{I}_y = 2299.11 \text{ in}^4$ ].

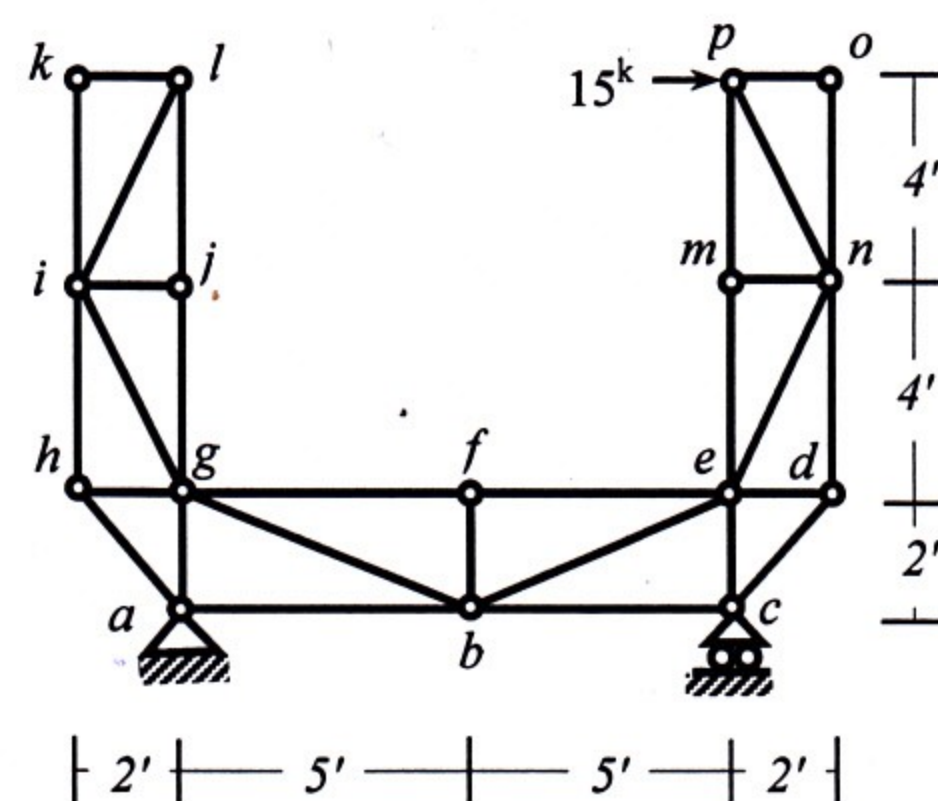
### PART C

Answer the following questions [10×3=30]

11. The cable ABC shown in **Fig.10** weighs 3 lb/ft and is subjected to a horizontal tension of 200 lb. Calculate  $d$ ,  $x$  and the maximum tension in the cable assuming it to be a (i) parabola, (ii) catenary.



**Fig.10**



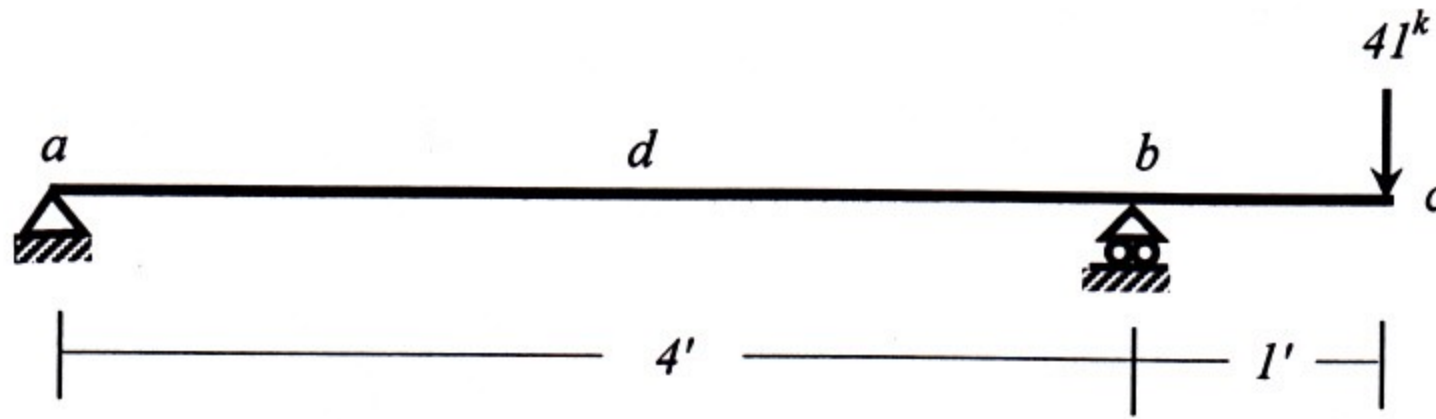
**Fig.11**

12. In the truss loaded as shown in **Fig.11** (i) Identify zero force members (ii) Calculate reactions at supports  $a$  and  $c$  and (iii) Calculate forces in member  $em$ ,  $en$  and  $dn$ .



**Answer 13(a) or 13(b)**

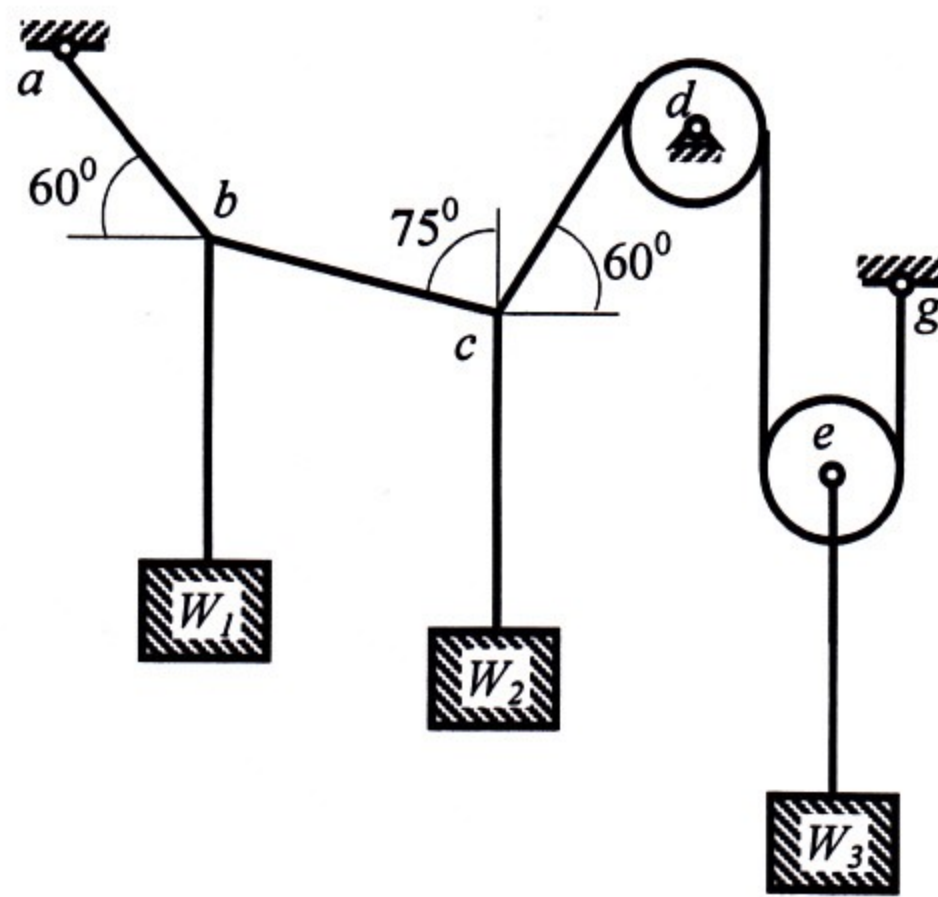
13(a) In the beam loaded as shown in **Fig.12**, calculate the i) reactions at supports **a** and **b** and ii) shear force and bending moment at midpoint of **ab** (**d** is the midpoint of **ab**).



**Fig.12**

**Or**

13(b) Two weights  $W_1$  and  $W_2$  (**Fig. 13**) are suspended from a cable **abcdeg** at point **b** and **c** respectively. Another weight  $W_3$  is suspended from a pulley **e**. Pulleys **d** and **e** are smooth and  $W_1$  weights 200 lb. Calculate the weights of  $W_2$  and  $W_3$ .



**Fig.13**



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Spring 2017**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Introduction to Civil and Environmental Engineering  
Time- 2 hours

Course Code: CE 107  
Full marks: 100

**PART I**

There are **THREE** questions. Answer any **TWO** (2\*25=50)

1. (a) Define *Environment*. What are the objectives of environmental education? [3+2]  
(b) Discuss the reasons and control measures for i) Industrial pollution ii) Noise pollution [10]  
(c) What is *Biodiversity* and *Biodiversity hotspot*? Explain the ethical value of biodiversity. [5+5]
2. (a) What is *Air Quality Index*? [5]  
(b) Give an example of: i) Primary air pollutant ii) Secondary air pollutant iii) Point source of water pollution iv) Non-point source of water pollution. [5]  
(c) Compare between the following: i) Natural and Cultural Eutrophication ii) Desertification and Deforestation iii) Traditional engineering and Green engineering [15]
3. (a) What is a *3R principle*? [5]  
(b) What is population dynamics? How does human population impact on global environment? [2+3]  
(c) Discuss the effects of i) Global warming ii) Ozone layer depletion iii) Acid rain [5+5+5]

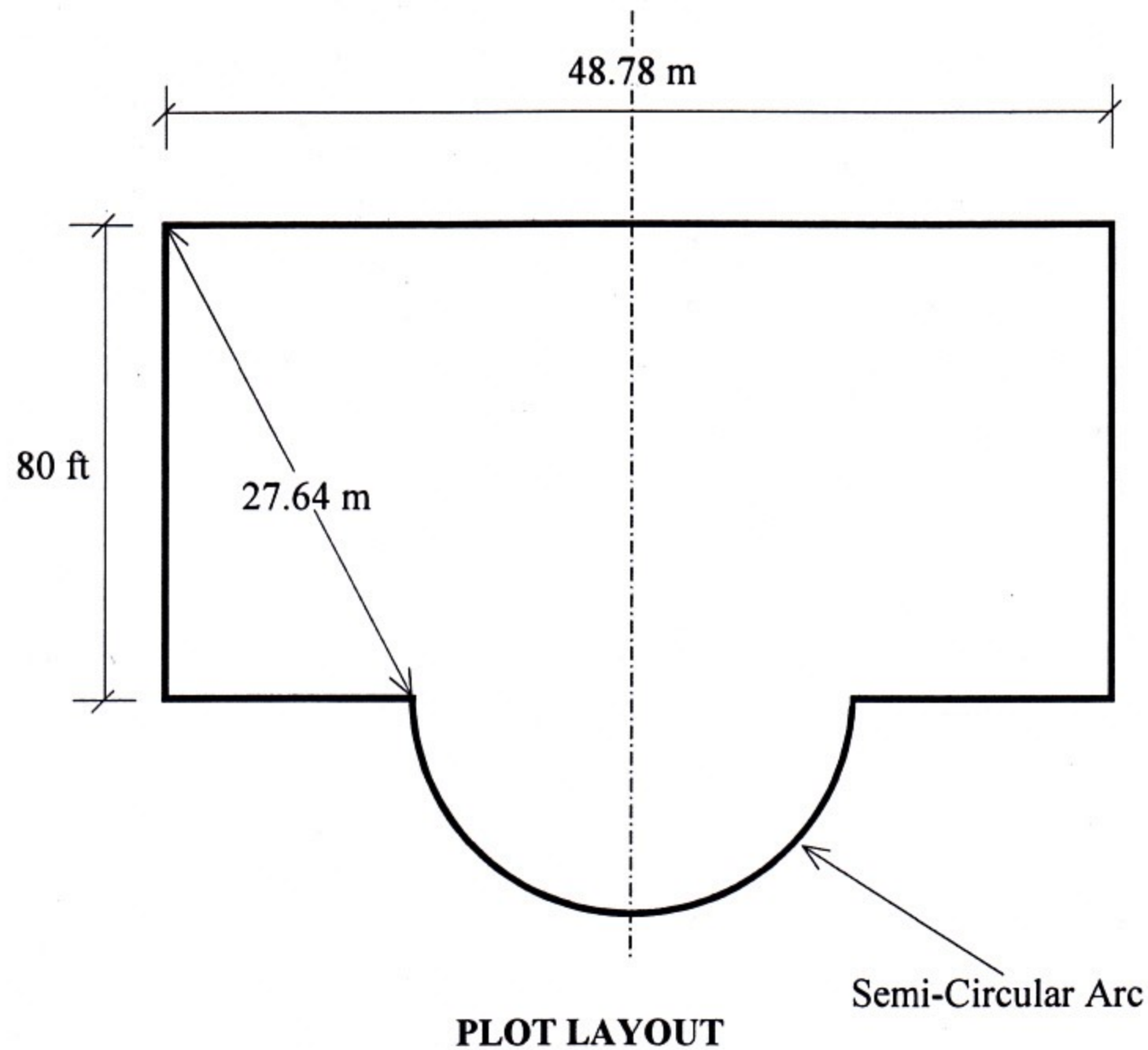
**PART II**

There are 4 questions. Question 4 is mandatory. In addition, answer any 2 among questions 5 through 7 (18+ 16 x 2 = 50).

4. A four-storied residential building is to be constructed. Estimate the construction cost of foundation, superstructure and boundary wall as per the following particulars and specifications of the building. Use PWD schedule and other relevant information provided in the attached appendix. 18

Sl No	Particulars	Specification
01	Land Size	Determine from plot layout as shown below
02	Building type	Residential (Economy)
03	Allowable Bearing Capacity ( $q_a$ )	4.0 ksf
04	Floor Level	Three
05	Plinth Area	53 % of Land Size
06	Construction Material	20 MPa, RCC Structure 1:1.5:3 (Brick Chips)
07	Ground Floor	Car Parking
08	Roof top RCC water tank including beams and	1500 Gallons
09	Structure type	RCC Frame Structure
10	Underground water reservoir, distribution line,	4500 gallons
11	Boundary wall	RCC frame
12	Incidental Cost	Consider 9% for this building





5. (a) Mention two simple points (each) related to the understanding of science, engineering and technology. 7.5  
 (b) Define civil engineering according to ASCE. 3  
 (c) Unit weight of water is  $9.81 \text{ kN/m}^3$ . Convert (showing unit detail) water's unit weight from this unit expression into  $\text{lb/ft}^3$ ,  $\text{gm/cm}^3$  and  $\text{kg/m}^3$ . 5.5
6. (a) What are the major sub-disciplines of civil engineering? What are the major foci of any civil engineering project? 1.5+2.5  
 (b) Give the names in details of the following codes with their related fields. 2  
 (i) BNBC (ii) AREA  
 (c) Define plane and geodetic surveying. 4  
 (d) Classify surveying based on instruments used. 4  
 (e) What are the major factors for choice of materials? 2
7. (a) Mention (names only) few types of loads to be considered in design. 5  
 (b) The following figure depicts a concrete block system. Calculate (showing unit detail) the total stresses (due to induced load of 500 N and self-weight of concrete) in  $\text{lb/in}^2$  (psi) and  $\text{N/mm}^2$  at sections SEC-1 and SEC-2. 11



