BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Urp. Examinations 2022-2023

Sub : **PLAN 343** (Traffic and Transportation Study)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions.

1. (a) Suppose a student, who resides in Mirpur, travels to BUET using public transport and other feeder services. Describe the five major components of transportation system with respect to his/her trip. **(15)**

   (b) In a transportation system, capacity of the weakest link is always a concern. Discuss this issue with appropriate example. **(12)**

   (c) Explain how flow entities differ from traffic. **(8)**

2. (a) PIEV is an individual characteristic which may vary from person to person – explain with relevant examples. **(12)**

   (b) In general, PHF value significantly varies between urban and rural areas. Explain the underlying reason behind this variation. **(8)**

   (c) Discuss the variation in monthly traffic pattern and yearly traffic pattern in the context of Bangladesh and abroad. **(10)**

   (d) Outline the necessity of urban road hierarchy. **(5)**

3. (a) Discuss the unique characteristics of traffic management that make it a sustainable approach. **(12)**

   (b) Different traffic management techniques can be applied to improve the existing traffic condition of Dhanmondi area - explain those measures. **(15)**

   (c) "Schedule management can change the traffic scenario of Dhaka city" – explain this statement with examples. **(8)**

4. (a) On a road section, the space mean speed was found 20 kmph and the space head way was 5 m at the optimum density. By calculating Flow and density, estimate the effects on the level of service (LOS) of that road section based on the flow and density relationship. Also, discuss the further effects on LOS due to increase in density. **(20)**

   (b) Outline the importance of understanding the LOS of a road. **(5)**

   (c) In Dhaka city, pedestrian(s) behavior is often responsible behind injuries or fatalities. Discuss some relevant measures to control the risky pedestrian behavior. **(10)**

PLAN 343

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.

5. (a) Explain the factors which should be considered in highway design. **(15)**

(b) The following tables give the particulars collected for a section of road 0.5 km long during the course of a moving observer study. For the calculation of flow in PCU per hour in both directions assume an equivalency factor of 1 per car, 3 for bus and 2 for trucks. Compute the journey speed. Journey: North bound: **(15)**

RUN	Journey time (min)	vehicles met with in the opposing direction			vehicles in the same direction	
		Car	Bus	Truck	Over-taking	Overtaken
1	2	12	06	01	0	1
2	2.3	11	01	02	1	0
3	1.8	8	09	01	2	0

Journey: South bound:

RUN	Journey time (min)	vehicles met with in the opposing direction			vehicles in the same direction	
		Car	Bus	Truck	Over-taking	Overtaken
1	2.1	13	3	2	1	1
2	2	10	3	1	1	0
3	2.4	15	2	3	0	1

(c) Sketch urban transport development paths. **(5)**

6. (a) Describe the importance of shoulder, cross-slope and lateral clearance in developing a highway. **(12)**

(b) Illustrate the advantages of using manual method in traffic volume survey. **(8)**

(c) Demonstrate the principles of Transit Oriented Development (TOD). **(15)**

7. (a) Identify the purpose of channelization in roads. **(10)**

(b) Interpret the use of O-D survey in transportation planning. **(10)**

(c) Demonstrate three types of TOD models with appropriate examples. **(15)**

8. (a) Discuss the advantages and disadvantages of rotary intersections. **(15)**

(b) Interpret the necessity of calculating parking accumulation, parking index and parking turnover in a parking survey. **(10)**

(c) Illustrate how land use market can be changed with the change of spatial accessibility condition. **(10)**

-------------------------------2-------------------------

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-3/T-1   BURP Examinations 2022-2023
Sub: **WRE 309** (Introduction to Water Resources Planning)
Full Marks: 210   Time: 3 Hours
The figures in the margin indicate full marks.
USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.
(Assume reasonable value for missing data, if any)

1. (a) What are the main applications of water resources engineering knowledge as an urban planner?   **(8)**

   (b) Write short notes on estimated world water quantities. What is the global average precipitation and evaporation?   **(8)**

   (c) Neatly sketch the "Hydrologic Cycle" and enlist their process of interactions.   **(8)**

   (d) A river reach had a flood wave passing through it. At a given instant the storage of water in the reach was estimated as 15.5 ha-m. What would be the storage in the reach after an interval of 3 hours if the average inflow and outflow during the time period are 14.2 m^3/sec and 10.6 m^3/sec respectively?   **(11)**

2. (a) Describe recording and non-recording rain gauges with figures.   **(8)**

   (b) What are the three commonly used methods for calculating the mean precipitation over an area? Which method will you apply for calculating the mean precipitation of an area if the rain gauges are not evenly distributed? Briefly describe the method.   **(8)**

   (c) The annual rainfall values at station P for a period of 20 years are given as below; calculate (i) The annual rainfall with a recurrence interval of 15 years (ii) The probability of occurrence of an annual rainfall of magnitude 100 cm at the station P.   **(8)**

Year	annual rainfall (cm)	Year	annual rainfall (cm)
1975	120	1985	101
1976	84	1986	109
1977	68	1987	106
1978	92	1988	115
1979	102	1989	95
1980	92	1990	90
1981	95	1991	70
1982	88	1992	89
1983	76	1993	80
1984	84	1994	90

   (d) The mass curve of rainfall in a storm with a total duration of 330 minutes is given below. (i) Generate data for hyetograph (ii) Calculate necessary data for deriving maximum Intensity-maximum Depth-Duration relationship (IDF).   **(11)**

WRE 309

Contd ... Q. No. 2(d)

Time since start (min)	0	30	60	90	120	150	180	210	240	270	300	330
Cumulative rainfall (cm)	6.1	18	21	36	43	49	52	53	54	60	66	72

3. (a) Distinguish between intermittent, perennial and ephemeral streams with figures. **(8)**

(b) What is calibration of a current meter? How can you use a current meter for stream flow measurement? **(8)**

(c) A small watershed consists of 2 km² of forest area (c = 0.1), 1.2 km² of cultivated area (c = 0.2) and 1 km² under grass cover (c = 0.35). A watercourse falls by 20 m in a length of 2 km. The IDF relation for the area may be taken as **(8)**

$$i = \frac{80T^{0.2}}{(t+12)^{0.5}}, \; i \text{ in cm/hr, } t \text{ in min and } T \text{ in yr}$$

Estimate the peak rate of runoff for a 25 yr frequency.

(d) The following data were obtained in a stream-gauging operation. A current meter with a calibration equation V = (0.32N + 0.032) m/sec, where N = revolution/sec, was used to measure the velocity at 0.6 depth. Using the mid-section method, calculate the discharge of the stream. **(11)**

Distance from right bank (m)	0	2	4	6	9	12	15	18	20	22	23	24
Depth (m)	0	.5	1.1	1.95	2.25	1.85	1.75	1.65	1.5	1.25	.75	0
No. revolutions	0	80	83	131	139	121	114	109	92	85	70	0
Time (sec)	0	180	120	120	120	120	120	120	120	120	150	0

4. (a) What are the factors that affect the shape of a hydrograph? **(9)**

(b) The following are the ordinates of the hydrograph of flow from a catchment area of 770 km² due to a 6-h ranfall. Derive the ordinates of the 6-hr unit hydrograph. Baseflow varies from 40 m³/sec to 42 m³/sec. **(9)**

Time from beginning of storm (hour)	0	6	12	18	24	30	36	42	48	54	60	66	72
Discharge (m³/sec)	40	65	212	360	400	350	270	205	145	100	70	50	42

(c) Define specific retention, specific yields, and intrinsic permeability. **(9)**

(d) A field sample of an unconfined aquifer is 60 cm long and 6 cm in diameter is tested under a constant head difference of 16.3 cm. As a result 0.0217 m³/sec flow rate was obtained. Determine the hydraulic conductivity of the aquifer sample. **(8)**

WRE 309

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

(Assume reasonable value for missing data, if any)

5. (a) Why do we need to manage water? **(5)**

   (b) Briefly explain the planning and management of water resources in the following scenarios: **(12)**

       (i) Too little water

       (ii) Too expensive water

   (c) Discuss the four dimensions of IWRM in detail. **(10)**

   (d) Briefly explain the requirements of a navigable waterway. **(8)**

6. (a) Why do rivers curve? **(5)**

   (b) Discuss the benefits of conjunctive use of surface water and groundwater in an irrigation project. **(7)**

   (c) Discuss in detail the options for flood mitigation in the context of Bangladesh. What specific measures could help enhance Bangladesh's approach to flood risk management in the future? **(10+5)**

   (d) Briefly explain the river training and bank protection works of the Padma Multipurpose Bridge project. **(8)**

7. (a) What are the various stages of a river? Explain briefly. **(7)**

   (b) Write short notes on the following irrigation methods: **(10)**

       (i) Furrow irrigation

       (ii) Sprinkler irrigation

   (c) What is a revetment? What are the characteristics and qualities of revetment? **(10)**

   (d) Explain the helical movement of water in a river bend with necessary sketches. How do meanders and cutoffs develop? **(8)**

8. (a) Briefly explain the general steps of a basic dredging process. **(5)**

   (b) Discuss the different types of river training works based on their purpose. **(10)**

   (c) What questions must be addressed to predict ecological and economic impacts from changes in land use and water management? **(10)**

   (d) What is EIA? Briefly explain the steps that need to be followed for a successful environmental impact assessment. **(10)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-3/T-1   BURP Examinations 2022-2023
Sub: **CE 361** (Elements of Solid Mechanics)

Full Marks: 210   Time: 3 Hours

The figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1.   (a) Write the difference between Engineering Stress and True Stress.   **(10)**

(b) Draw stress strain diagram of mild steel showing its different components.   **(8)**

(c) Draw Axial Force Diagram of the following elastic steel beam (Figure 1). Determine the relative displacement of point D from point A for the elastic steel bar of variable cross sections shown in Figure 1 caused by the application of concentrated forces. Areas A_{AB} = 3000 mm^2, A_{BC} = 1500 mm^2, A_{CE} = 750 mm^2. Modulus of Elasticity, E = 200 GPa.   **(17)**
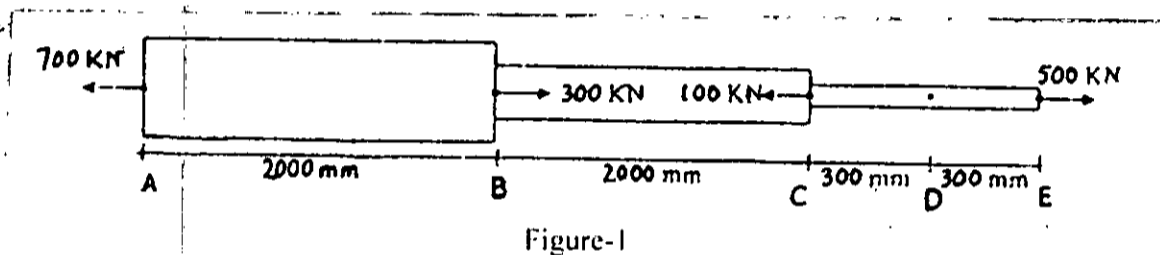
Figure-1

2.   (a) State the assumptions of truss analysis.   **(5)**

(b) A bracket of negligible weight shown in Figure 2 is loaded with a vertical force P of 3 kips. For interconnection purposes, the bar ends are clevised (forked). Pertinent dimensions are shown in the figure. Find the axial stresses in members AB and BC and the bearing and shear stresses for pin C. All pins are 0.375 in diameter.   **(30)**

Figure 2.
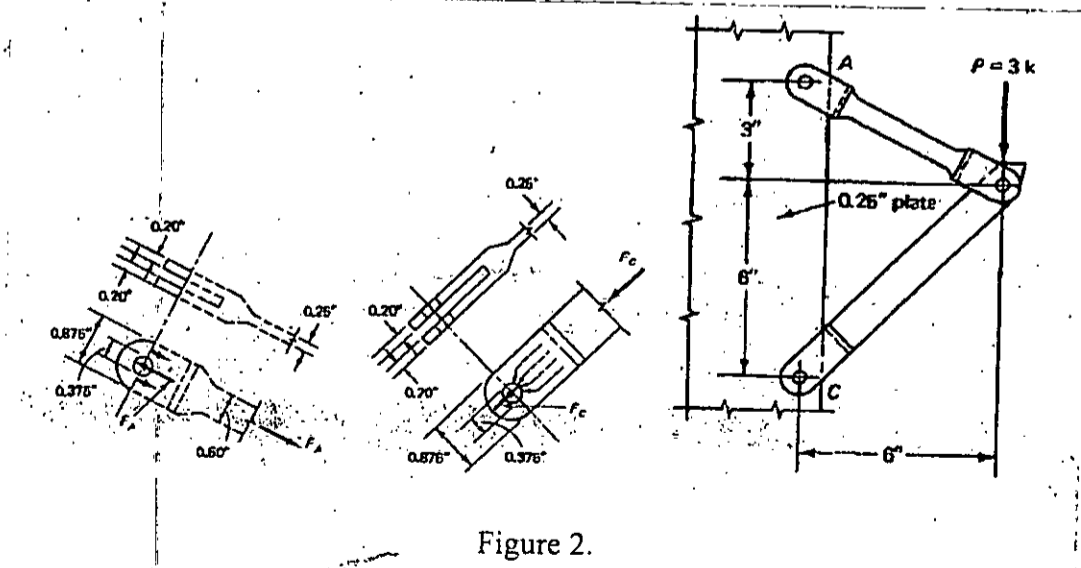
3. (a) Define shear force and bending moment with their sign convention. **(5)**

(b) What is a rigid body? Distinguish between uniformly distributed load and uniformly varying load with diagrams. **(10)**

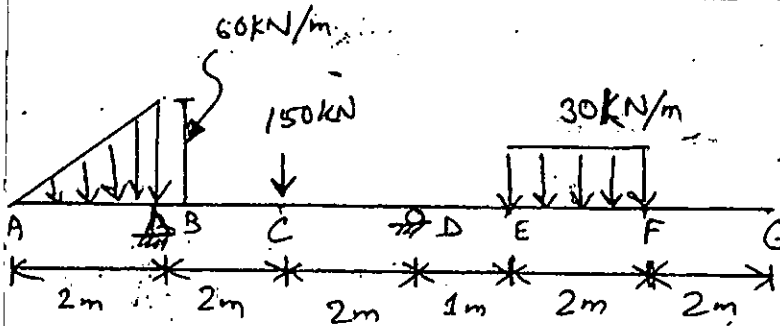(c) Draw shear force and bending moment diagram of the following beam. (Figure 3) **(20)**

Figure 3.

4. (a) Find the reaction at support and select the size of member AB, BC, CE, DF, DE and EG in the truss of figure 4 for the given loading condition. Given allowable stress is 20 ksi. All joints are pin connected. **(17½)**
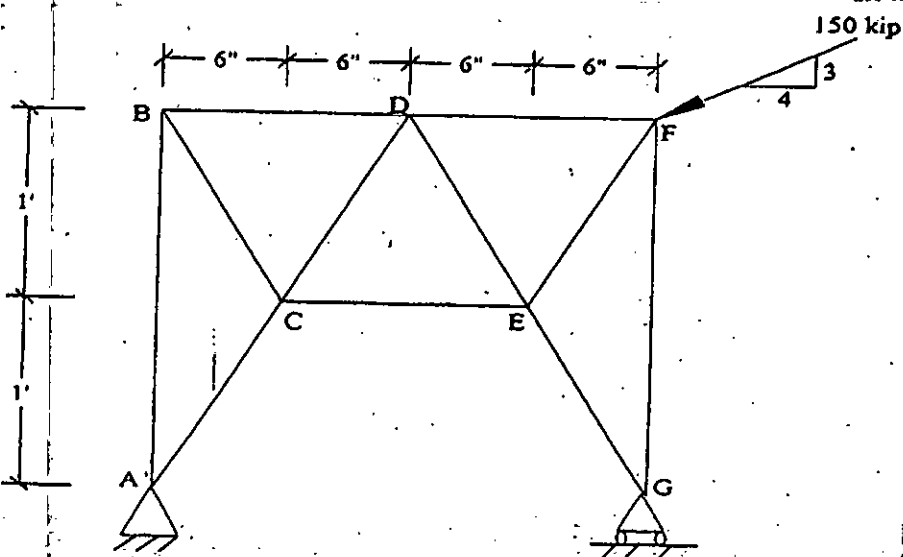
Figure 4

(b) The section of a column (shaded portion) has the dimension shown in Figure 5.
Find the least radius of gyration of this section. (17½)
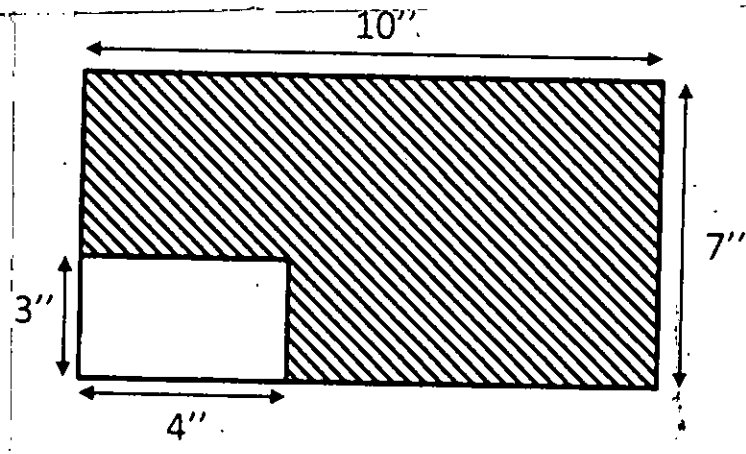
Figure 5

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.

5.   (a) Define types of support systems with examples. (10)

(b) Define point force, linear force, and surface force with examples. Describe three systems of units used for measurement. (10)

(c) The bodies A and B, connected by a cord and resting on smooth planes, weight W_A = 25 Kip. and W_B = 20 Kip. The forces acting on these bodies are shown in Figure 6. (15)

   (i)   Determine the cable tension and surface reactions of body A and body B.

   (ii)   Find the angle θ.
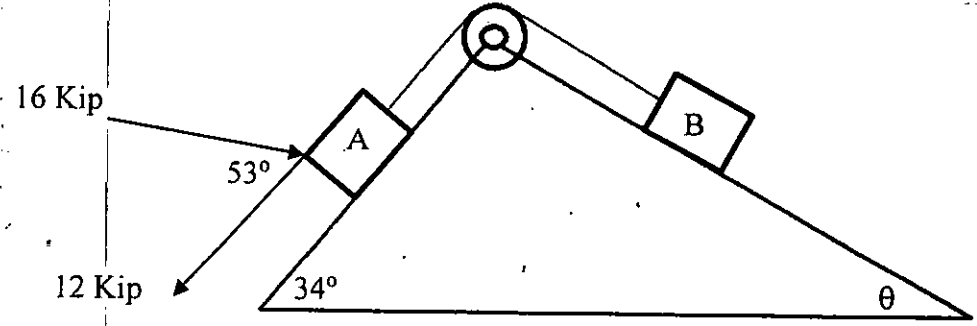
Figure 6

6.   (a) Define Two force members. Why are they used in Truss?   (10)

(b) Define concurrent force system. Write down the equilibrium conditions for concurrent forces.   (10)

(c) Determine the weight of the heaviest cylinder, which can be placed in the position shown in Figure 7 without exceeding a stress of 8000 psi in the cable BC. Neglect the weight of the bar AB. The cross-sectional area of the cable BC is 0.10 inch^2. Also, determine the support reactions at pin 'A'.   (15)
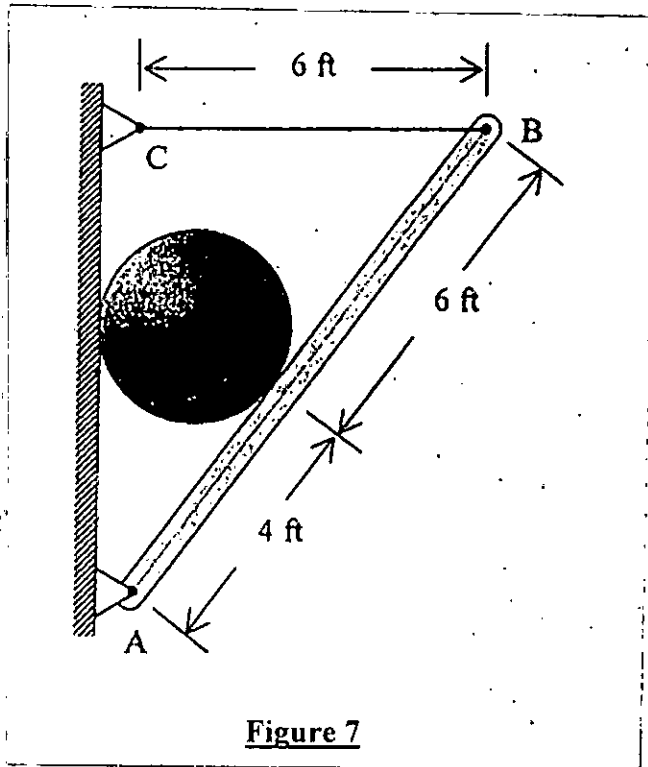
Figure 7

7.   (a) Define 'Moment' along with its characteristics.   (10)

(b) In the system of shaves in Figure 8, what force F will hold a weight of 800 lb in equilibrium? What will be the tension in cable A, B & C? There are no frictional losses at the axes.   (10)
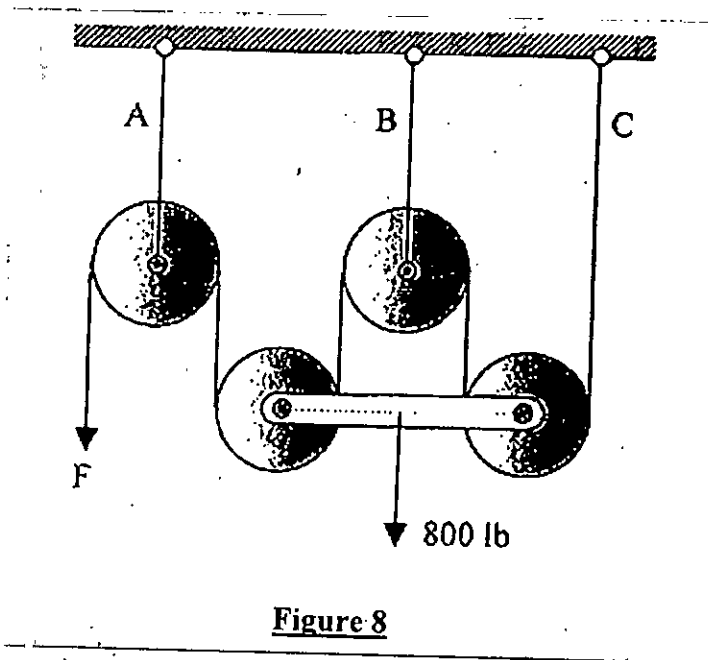
Figure 8

(c) A concrete wall of density 120 lb/ft^3 measures 4 ft × 5 ft × 1 ft. There is a horizontal pressure of 50 psf from one side of the wall, as shown in Figure 9. **(15)**

    (i)   Will the block overturn (Figure 9)?

    (ii)   What must be the value of 'q' in psf to prevent sliding and overturning about the point 'A' as sown in Figure 10?
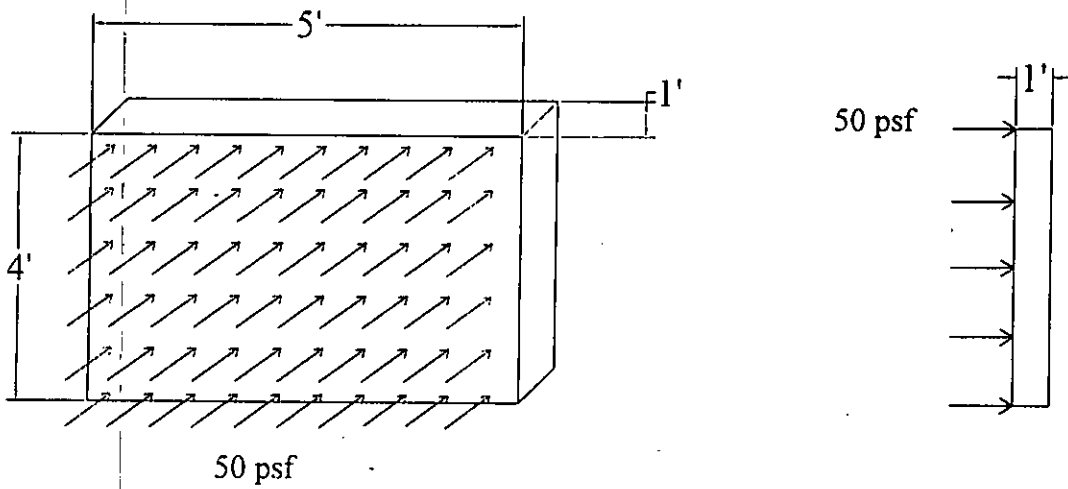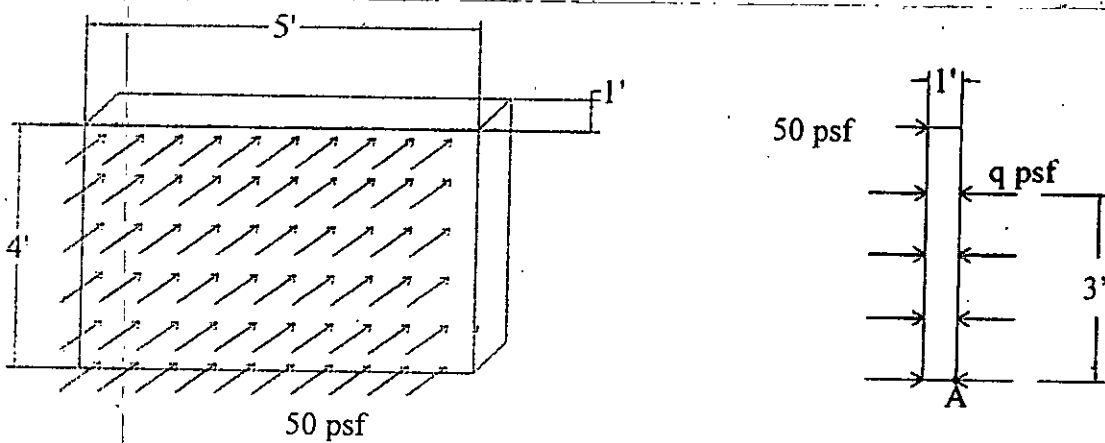
<u>Figure 9</u>

<u>Figure 10</u>

CE 361

8. (a) Define Moment if Inertia. State and explain the Parallel Axis Theorem. **(8)**

(b) Determine the volume generated by revolving the semi-circle shown in Figure 11, 270° about both the x-axis and y-axis. **(12)**
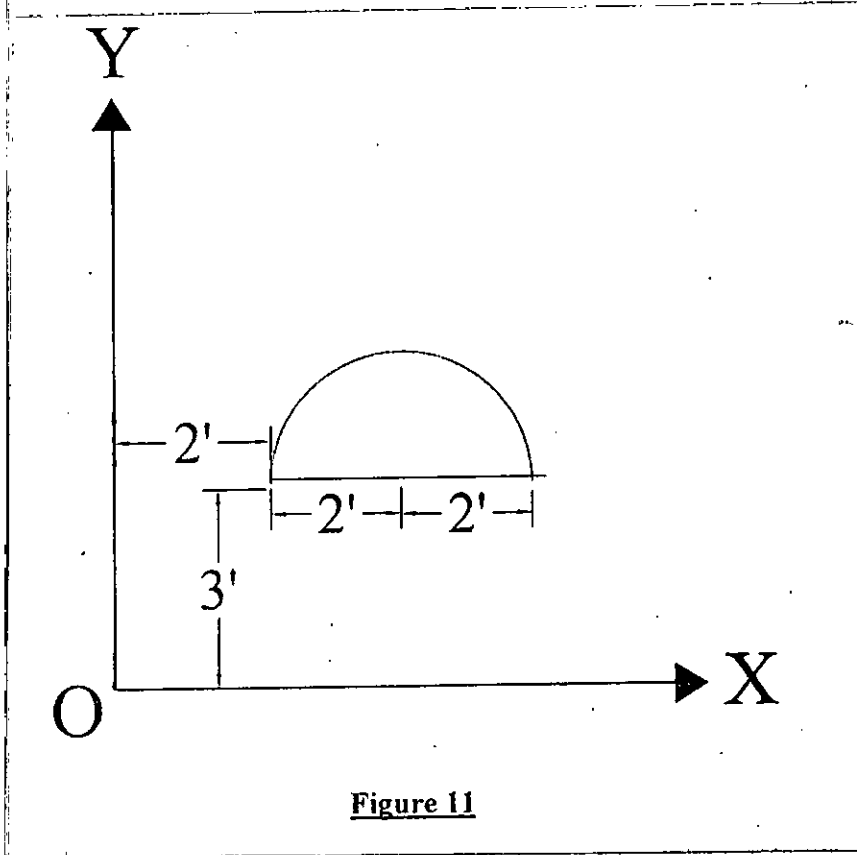
Figure 11

(c) Locate and centroid of the shaded area given in Figure 12. Locate the centroid using a clear illustration. **(15)**
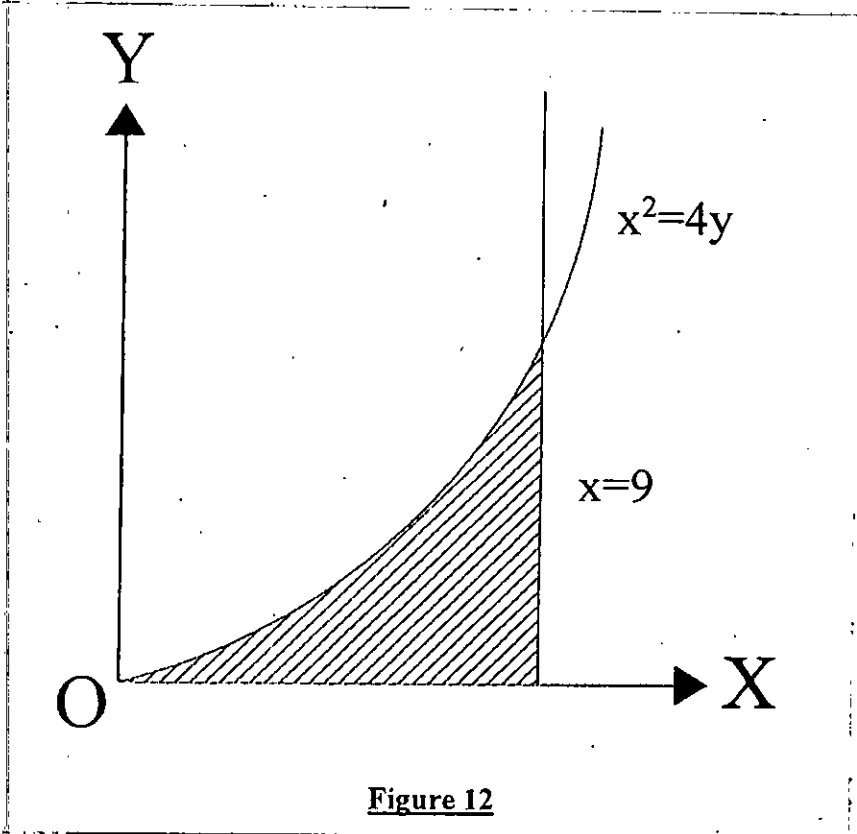
Figure 12