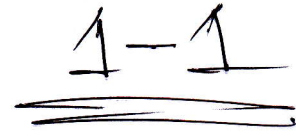# University of Asia Pacific
Department of Civil Engineering
Semester Final Examination (Spring 2017)
Program: B.Sc. (Honours) in Civil Engineering
Year: 1st   Semester: 1st

Course Code: HSS 101   **Course Title: English Language I**
Time: 3 hour   **Full Marks: 50**

1. Read the following passage and answer to the questions: **5**

The Battle of Chancellorsville, one of the most famous battles of the Civil War, took place in Virginia in the spring of 1863. The Confederate troops were led by perhaps the most revered military tactician in American history, General Robert E. Lee. The Union soldiers were led by "Fighting" Joe Hooker.

In appearance, personality, and lifestyle, these men were nearly perfect opposites. Lee, an older man in poor health with a gray beard, had a somber, measured demeanor. Hooker was a blond, strapping young man whose vanity over his appearance was but one aspect of his egotism. Whereas Lee was devout and principled, Hooker was known for his rollicking enjoyment of both women and whiskey.

Lee, despite his disadvantages of both numbers and position, did not retreat. Instead, he moved his troops into position to attack. Union soldiers who tried to warn Hooker that Lee was on the offensive were dismissed as cowards. When Lee's army attacked the Union soldiers at 5:00 p.m., they were eating supper, completely unprepared for battle. They abandoned their rifles and fled as Lee's troops came shrieking out of the brush, bayonets drawn. Against all odds, Lee won the Battle of Chancellorsville, and Hooker's forces withdrew in defeat.

a. When did the Battle of Chancellorsville during American Civil War take place?

b. Who were the two parties engaged in the war and who were their commanders?

c. What were the main character differences between the two commanders?

d. Which party did win the battle and how?

e. In the second passage, what does the word **somber** mean?
   i. dull   ii. hurry   iii. attractive   iv. funny

2. Write six separate sentences with any 3 pairs of words: **6**
   a. bored, board   b. night, knight   c. toad, towed   d. brake, break

3. Put the verb in the correct form: **5**
   a. Please _____ (not come) to see me before 5, I _____(sleep).
   b. It _____ (be) the worst storm we ever _____ (have).
   c. It is the first time I _____ here (be), so I _____ (not can) tell you where the station is.
   d. My favourite cinema director _____ (make) a film 3 years ago, but this year he _____ (not produce) anything.

e. "The weather _____ (be) very good next weekend", _____ (say) the old man looking at the sky.

4. Identify the misspelled words, misused capitalization and punctuation in the following passage and rewrite the whole passage correctly: **4**

Sport in Bangladesh is a popular from of entertainment as well as an essansial part of Bangladeshi culture. Kabaddi is the nashonal sport of Bangladesh. However, criket and football are considered as the most popular sports in Bangladesh. Bangladesh achieved arguably their greatest heights in ODI cricket when they defaeted three of the top-rated teams in 2015. In april 2015, they whit-washed Pakistan and clinsed the series 3-0. It was another major acheivement when they won a series against India 2-1 in June 2015. They stuned south Africa, defeating them 2-1 in an ODI series in the month of July and cemented their spot in Champions Trofy, 2017

5. Describe all the things you can see in the picture and explain what you think is happening: **6**
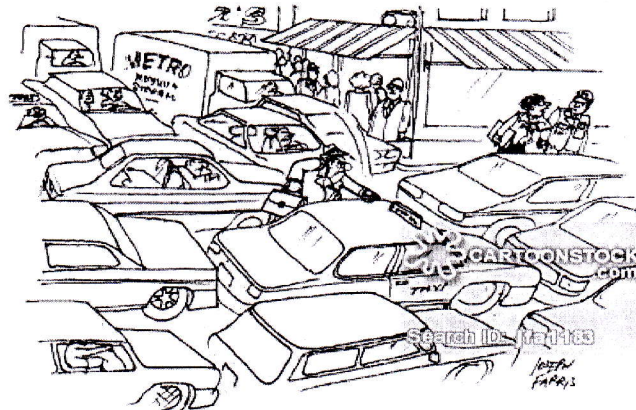
"Hurry officer...pedestrian rage!!"

6. Compose a paragraph on any <u>one (1)</u> of the following (150-180 words):   **8**

a) If I were invisible for a day
b) Compare public university with private university

7. Write a report on a Film Festival (120-150 words)   **8**

8. In the following paragraph you will find first 3 sentences of a story. Continue the story using your own imagination and give a suitable title to it. (ca. 120-150 words)   **8**

       Mother died yesterday. The death news shocked me so much that I could not think anything. I quickly managed a flight ticket to Dhaka.........

Course Title: Mathematics-I   Course Code: MTH 101
Time: 3.00 Hours.   Full Marks: 150

There are **Eight** questions. Answer any **Six**. All questions are of equal value in the right margin indicate marks.

1. (a) Let $f(x) = x^3 - 4x$.   5
         Find the equation of the secant line through the points $(-2, f(-2))$ and $(1, f(1))$.

    (b) Show that there is only one point c in the interval $(-2, 1)$ that satisfies   12
         the conclusion of the Mean-Value Theorem for the secant line in part (a).

    (c) Find the equation of the tangent line to the graph of $f(x)$ at the point   8
         $(c, f(c))$.

2.   Let $f(x) = 2x^3 - 3x^2 - 36x + 5$. Then find the open intervals on which   25
         $f(x)$ is increasing and decreasing, concave up and concave down. Also
         find its all relative extrema.

3.   Find the following integrals: 25

    i) $\int x^2 \ln x \, dx$

    ii) $\int \frac{dx}{x^2\sqrt{x^2+1}}$

    iii) $\int \frac{1}{e^x + e^{-x}} dx$

    iv) $\int [\sin(\cos\theta)\sin\theta] \, d\theta$

4.   Evaluate the following integrals: 25

    i) $\int_0^2 (2x+1)\sqrt{x^2+x+1} \, dx$

    ii) $\int_1^3 \frac{1}{\sqrt{x}\,(x+1)} dx$

    iii) $\int_0^{\ln 5} e^x(3 - 4e^x) \, dx$

    iv) $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \sin\theta \sqrt{1 - 4\cos^2\theta} \, d\theta$

5. (a) Find the area of the region that is enclosed between the curves $y = x^2$ 10
         and $x = y - 2$.

(b) Find the volume of the solid generated when the region between the graphs of the equations $y = \frac{1}{2} + x^2$ and $y = x$ over the interval $[0, 2]$ is revolved about the x-axis.   **15**

6. **(a)** Find the arc length of the curve $x = \cos 2t$, $y = \sin 2t$, $(0 \le t \le \pi)$.   **13**

(b) Show that if a body released from rest (initial velocity zero) is in free fall, then its average velocity over a time interval $[0, T]$ during its fall is its velocity at time $t = \frac{T}{2}$.   **12**

7. **(a)** Derive a formula for $\int \tan^n x \, dx$. Hence compute the integral $\int \tan^3 x \, dx$.   **15**

(b) Find the area of the surface that is generated by revolving the portion of the curve $y = x^2$ between x=1 and x=2 about the y- axis.   **10**

8.   Define Gamma and Beta functions. Show that,   **25**

   i) $\beta(m, n) = 2 \int_0^{\frac{\pi}{2}} \sin^{2m-1} \theta \cos^{2n-1} \theta \, d\theta$, $m, n > 0$

   ii) $\beta\left(\frac{1}{2}, \frac{1}{2}\right) = \pi$.

   iii) $\beta(a, b) = \beta(b, a)$

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   Course Code: CE 107

Time- 2 hours   Full marks: 100

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

1. (a)	Define i) *Environment*, ii) *Environmental pollution* and iii) *Environmental ethics.*	6
(b)	Mention reasons and control measures for i) industrial pollution ii) noise pollution	10
(c)	What is Biodiversity? Why is it necessary to protect 'Biodiversity'?	4+5
2. (a)	Make a list of natural disasters of Bangladesh.	5
(b)	Compare between the following: i) Primary and Secondary air pollutant ii) Natural and Cultural Eutrophication iii) Desertification and Deforestation iv) Traditional engineering and Green engineering	20
3. (a)	What is *a 3R principle*?	5
(b)	Describe the relationship between Human and Environment.	10
(c)	What is *Air Quality Index*? Discuss the effects of global warming.	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 three-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 (Standard)
03	Allowable Bearing Capacity (q_a)	3.0 ksf
04	Floor Level	Three
05	Plinth Area	57 % of Land Size
06	Construction Material	24 MPa, RCC Structure 1:1.5:3 (Stone 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, water pump, pump house, WASA charge	4500 gallons
11	Boundary wall	RCC frame
12	Incidental Cost	Consider 9% for this building

PLOT LAYOUT
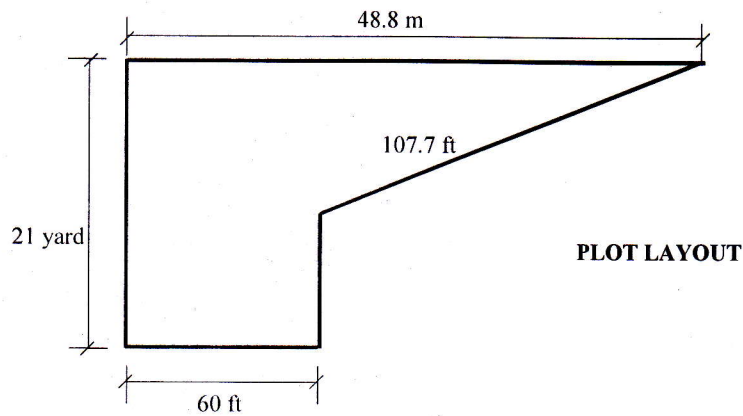
5. (a) Using a diagrammatic expression mention some features of scientists, engineers, society and technology.   5

(b) Unit weight of water is 9.81 kN/m³. Show conversion of water's unit weight from this value into gm/cm³ and also into kg/m³. Also calculate the pressure of water in psi at the bottom of Karnaphuli Dam if the height of water is about 100 foot.   6

(c) Calculate (showing unit detail) the weight of a brick (W_b) in kg if its size is about 9.5 in x 4.5 in x 2.75 in. Consider unit weight of brick material (γ_{bm}), 125 lb/ft³.   5

6. (a) What are the major sub-disciplines of civil engineering? Mention some other sub-disciplines that are inevitably participatory in any civil engineering project. What are the major foci of any civil engineering project?   1+1+2

(b) Classify building according to type of occupancy. What are the major factors for choice of materials?   3+1

(c) Define plane and geodetic surveying. Classify surveying based on instruments used.   2+2

(d) Briefly discuss "Civil Engineering" as a career.   4

7. (a) Mention (names only) few types of loads to be considered in design.   4

(b) You have a square plot as shown below. Apply RAJUK's rule to find the total floor area and the number of stories that can be built on your plot.   12
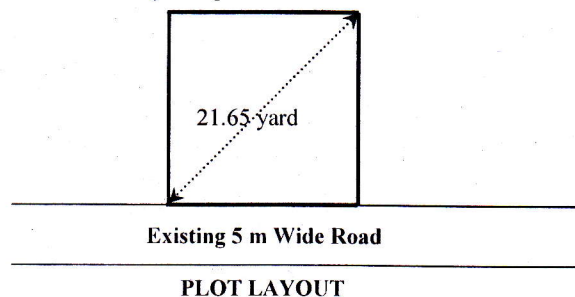
Existing 5 m Wide Road

PLOT LAYOUT

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 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) Define Doppler effect. Find out the apparent pitch of sound, when the source moves toward and away from the stationary observer. **[15]**

    (b) Two trains travelling in opposite directions at 100 km/hour each, cross each other while one of them is whistling. If the frequency of the note is 800 Hz, find the apparent pitch as heard by an observer in the other train: (a) before the trains cross each other (b) after the trains have crossed each other. Velocity of sound in air =340 m/s. **[10]**

2. (a) 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 $y_1 = 2 \sin(\omega t + \pi/6)$ and $y_2 = 3 \sin(\omega t + \pi/3)$. Calculate (i) amplitude (ii) phase constant (iii) time period 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. **[20]**

    (b) A piezo-electric X-cut quartz plate has a thickness of 1.5 mm. If the velocity of propagation of longitudinal sound waves along X direction is 5760 m/s, calculate the fundamental frequency of the crystal. **[05]**

4. (a) State and explain three essential requisites of a Carnot's reversible engine. Distinguish between Carnot's engine and refrigerator and also prove that efficiency of refrigerator is more than hundred percent. **[15]**

    (b) A Carnot's refrigerator takes heat from water at 0^0 C and discards it to a room at 27°C. 1 kg of water at 0^0C is to be changed into ice at 0^0C. How many calories of heat are discarded to the room? What is the work done by the refrigerator in this process? What is the coefficient of performance of the machine? **[10]**

Turn over

5. (a) Define equilibrium state and state Zeroth law of thermodynamics. State and explain Newton's law of cooling. [15]

(b) A liquid cools in 6 minutes from 80^0C to 60^0C. What will be its temperature after the next 10 minutes? Temperature of the surrounding is 30^0C. Assume that the Newton's law of cooling is applicable throughout the process. [10]

6. (a) State first and second law of thermodynamics. State and explain Carnot's cycle and find out the efficiency of Carnot's reversible engine. [15]

(b) A Carnot's engine whose temperature of the source is 400 K takes 200 calories of heat at this temperature and rejects 150 calories of heat to the sink. What is the temperature of the sink? Also calculate the efficiency of the engine. [10]

7. (a) How can you produce Newton's rings using a monochromatic light? Prove that $r^2=n\lambda R$ for Newton's dark ring, where the terms have their usual meanings. [15]

(b) A plano-convex lens of radius 300 cm is placed on an optically flat glass plate and is illuminated by monochromatic light. The diameter of the 8th dark ring in the transmitted system is 0.72 cm. Calculate the wavelength of light used. [10]

8. (a) State and explain Brewster and Malus law for a polarized light. [20]

(b) If the plane of vibration of the incident beam makes an angle of 30^0 with the optic axis, compare the intensities of extraordinary and ordinary light. [05]

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

Course Title: Engineering Mechanics I   Credit Hours: 3.0   Course Code: CE 101
Time: 3 hours   Full Marks: 100 (= 10 × 10)

PART A

Answer any 5 (five) of the following [7 questions]

1. In the structures shown in **Fig.1** draw the free-body diagram of
   (a) Member **bcdef,** Cable **ae** and Support **a** [**Fig.1(a)**]
   (b) Member **gij** and Support **j** [**Fig.1(b)**]
   (c) Member **mol**, and Support **n** [**Fig.1(c)**]
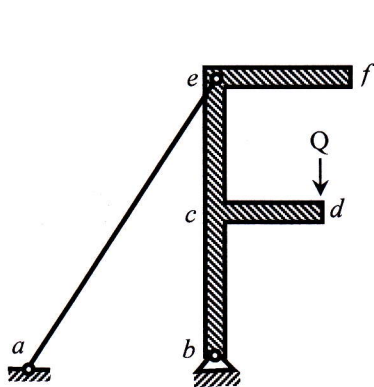
Fig.1(a)   Fig.1(b)   Fig.1(c)
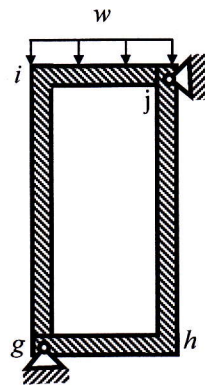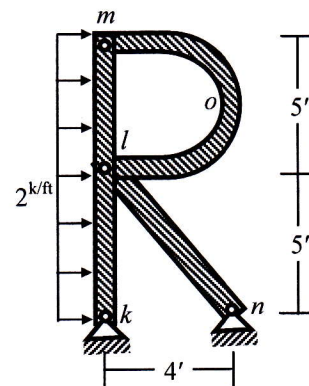
2. In the structure loaded as shown in **Fig.1(c)**, calculate the (i) reactions of supports **k** and **n** and
   (ii) pin reactions at joint **m** and **l**.

3. The cable ABC shown in **Fig.2** weighs 2 kg/m and is subjected to a horizontal tension of 500 kg.
   Calculate d, x and the maximum tension in the cable assuming it to be a parabola or catenary.
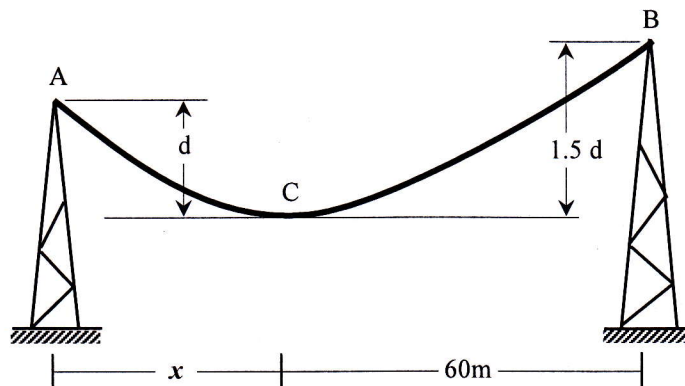
Fig.2

4. Two weights W1 and W2 (*Fig. 3*) are suspended from a cable *abcdeg* at point *b* and *c* respectively. Another weight W3 is suspended from a pulley *e*. Pulley *d* and *e* are smooth and W3 weights 500 kg. Calculate the weights of W1 and W2.
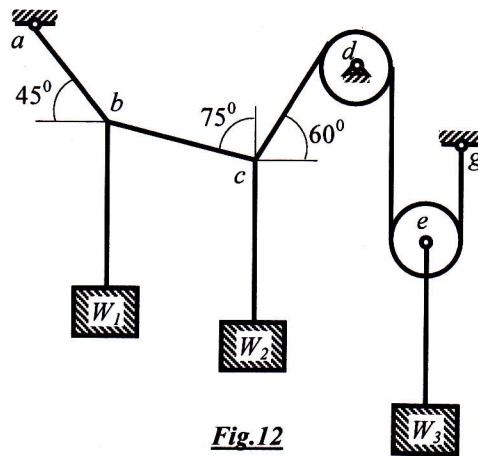

Fig.12

5. In the truss loaded as shown in *Fig.4*
   (i) Identify zero force members.
   (i) Calculate reactions at supports *h* and *p*.
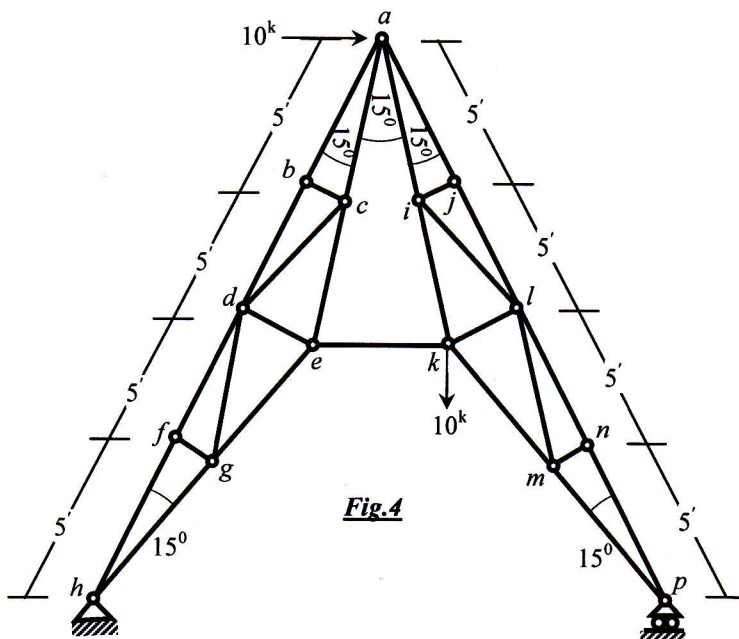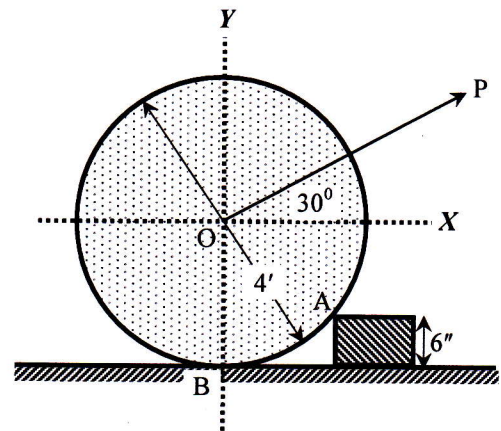   (ii) Calculate forces in member *bd*, *ce* and *ek*.

Fig.4

Fig.5

6. What force P will cause the wheel (as shown in *Fig.5*) to be on the point of moving over the block A? The wheel weights 2000 lb.

7. **Fig.6** shows a system of forces acting on a structure (shown by dotted lines). Calculate the magnitude, direction and location of resultant of the forces.
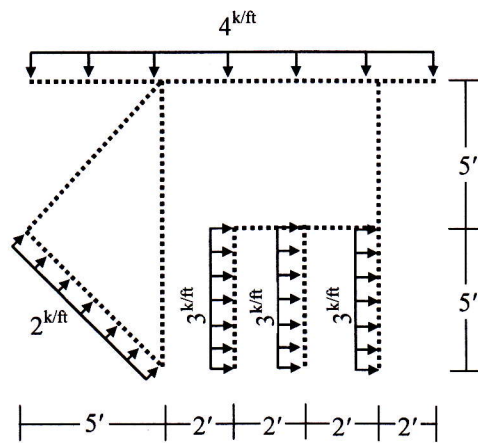
Fig.6

PART B

Answer the following questions

Answer question No 8(a) or 8(b)

8(a). Locate the centroid of the composite weight with respect to given co-ordinate system as shown in *Fig.7* [Given: Unit weight of concrete, $\gamma_{concrete}$ = 150 lb/ft^3; unit weight of steel, γ_{steel} = 490 lb/ft^3].
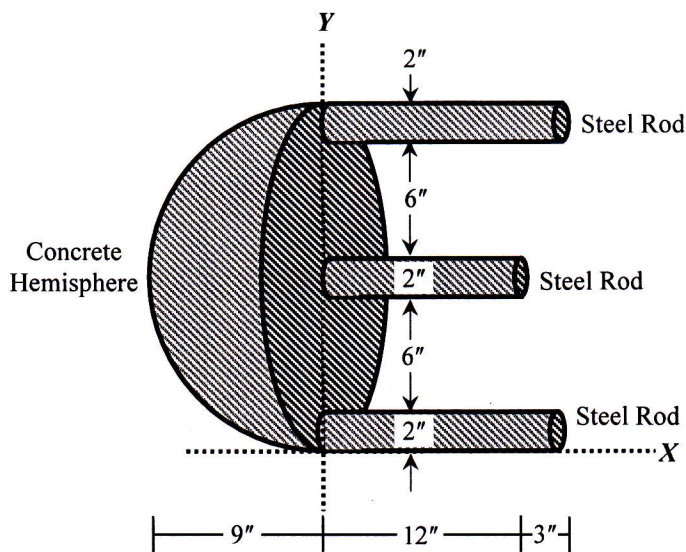

Fig.7
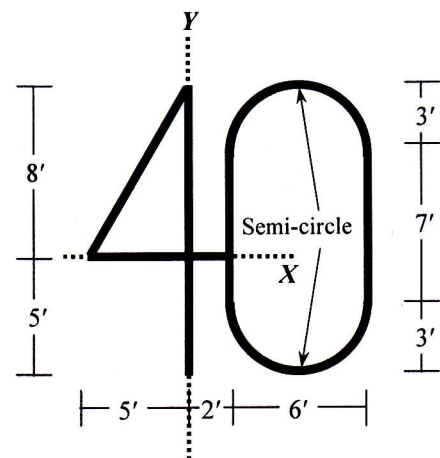
Fig.8

8(b) Locate the centroid of the composite line with respect to given co-ordinate system as shown in *Fig.8*.

Answer question No 9(a) or 9(b)

9(a). Locate the centroid of the composite area with respect to given co-ordinate system as shown in **_Fig.9._**

9(b). Locate the centroid of the shaded area with respect to given co-ordinate system by integration method as shown in **_Fig.10_**.

Fig.9

$y = 5 \cos x$
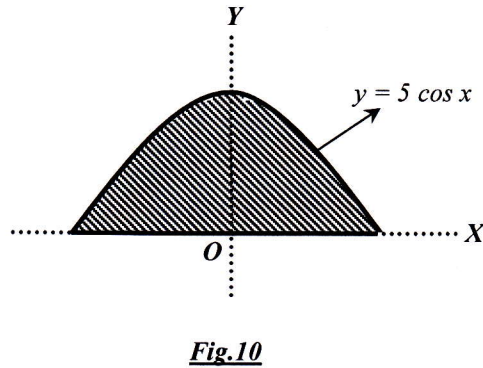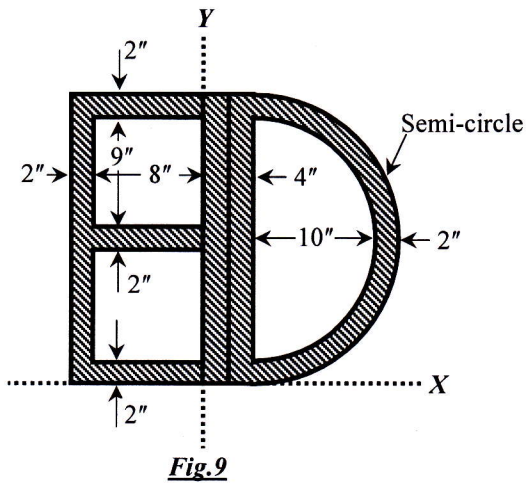
Fig.10

10. Compute moment of inertia of the shaded area with respect to given co-ordinate system by integration method as shown in **_Fig.10_**.

11. 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.11._**

Fig.11
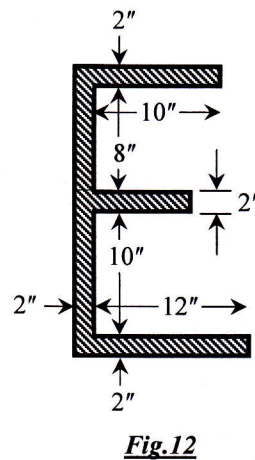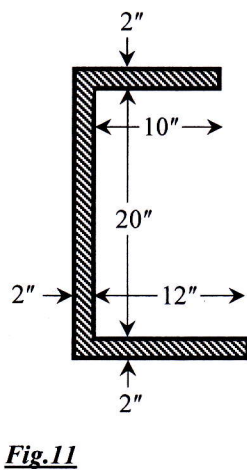
Fig.12

12. Compute moment of inertia I_x, I_y and J of the shaded area as shown in **_Fig.12_** with respect to centroidal axes.