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University of Asia Pacific
Department of Civil Engineering
Semester Final Examination (Fall 2015)
Program: B.Sc. Engineering

Course Code: HSS 101

Course Title: English Language I

Course Credit: 3 hours

Time: 3.00 Hours

Full Marks: 50

Section – A

Read the passage carefully and then answer the corresponding questions. 5 x 1 = 5

Although not the longest river in America, **the Rio Grande** is one of the most important. But, unlike other significant rivers, it is not used for shipping. In fact, oceangoing ships cannot navigate the waters. No, what makes the Rio Grande so important is its location. Since 1846, it has been the official border of Texas and Mexico.

The Rio Grande is either the fourth or fifth longest river system in North America. It all depends on how it is measured. Because the river twists so much, it occasionally changes course. And these course shifts can cause it to be longer or shorter. At its last official measure, the Rio Grande clocked in at 1,896 miles. The river starts in Colorado and extends downward to the Gulf of Mexico. Downward is the best way of describing it too. Not only does the river extend south, but it also starts in the mountains and gets lower and lower in elevation as it extends to the Gulf. Its name is Spanish for the “Big River,” but the Rio Grande is actually known as Rio Bravo in Mexico. “Bravo” translates as “**furious**,” so the name makes sense. Because of its twists and turns, it certainly does seem to be angrier than most rivers!

The Rio Grande today is mostly used as a source of drinking water. Sadly, much of the water has been drained from the river. Parts of the river are almost dry! This is because people use more water from the river than the river can get back from rain and other sources. Experts are working to correct this, though, with hopes of restoring the river to its past strength. Today, the river is important as a source of water for Texans and Mexicans. More important, it is a symbol of cooperation between two nations. Though borders like the Rio Grande separate nations, they are also shared spaces. The Rio Grande is therefore a symbol of friendship and peace between two peoples.

1) According to the passage, why is the Rio Grande so important?

- A. It is a source of drinking water for most of the United States.
- B. It is the border of Texas and Mexico.
- C. It is the longest river system in the United States.
- D. It is known by two different names.

2) In paragraph 3, the author most likely writes that “downward is the best way of describing it too” to

- A. prove that the Rio Grande’s water levels have gone down recently
- B. argue that the Rio Grande has changed shape over the years
- C. highlight the fact that the Rio Grande flows south and from high elevations
- D. explain why the Rio Grande is known as the Rio Bravo down in Mexico.

3) Based on its use in paragraph 4, the word furious most nearly means

- A. angry

- B .large
- C .twisted
- D. dry

4) According to the passage, the Rio Grande has endpoints in

- A .Texas and the Gulf of Mexico
- B .New Mexico and Colorado
- C. Texas and Mexico
- D. Colorado and the Gulf of Mexico

5) Why Rio Grande is slowly going to dry?

- A. Because the river is small
- B. Because people use more water than the river can get back
- C. Rio Grande's border is losing its strength
- D. Because the water is polluted

Section – B

6. Complete the following sentences using appropriate prepositions.

5

- a) Please vote _____ the Sundarbans as one of the seven wonders of nature.
- b) Most political victims are poor people who live _____ hand to mouth.
- c) A tunnel is being built _____ the Karnafuli river.
- d) Listen to your teacher _____ talking in the classroom.
- e) She wrote a wonderful book _____ grammar.

7. Add either prefix or suffix with any five (5) of the following words and make a sentence with each of the new words.

5

mis-, fore-, sub-, -less, -ment, -ous, -semi

Care, cast, take, marine, joy, final, enjoy

8. Fill in the blanks with appropriate parts of speech.

6

- (a) We are God's _____ (creative) and we must _____ (belief) in him.
- (b) Jolie starts to _____ (critic) Allen because she _____ (hateful) him.
- (c) Hope you have all the _____ (energetic) you need to _____ (success) complete your endeavors.

9. Make sentences from any Three (03) Homophones (pair words) that are given below. 6

- a. Flour, Flower
- b. Knight, Night
- c. Rose, Rows
- d. Fairy, Ferry

10. The following excerpt has some misspelled words, misused capitalization and punctuation. Trace them out and rewrite the passage correctly.

8

about a hundred years ago there lived a great general whose name was napoleon bonaparte. he was the leader of the french army and france was at war with nearly all the contries around. he wanted very much to take his soldiers into italy but between france and italy there are high muntains called the alps, the tops of which are covered with snow.
"is it possible to cross the alps?" said napoleon.

the men who had been sent to look at the passes over the mountains shook their heads. then one of them said, "it may be posible, but.."
"let me hear no more," said napoleon. "forward to italy!"
people laughed at the thought of an army of sixty thousand men crosing the alps where there was no road. but napoleon waited only to see that everything was in good order, and then he gave the order to march.

the long line of solders and horses and cannon stretched for twenty miles. when they came to a steep place where there seemed to be no way to go farther, the trumpets sounded "charge!" then every man did his best, and the whole army moved right onward.
soon they were safe over the alps. in four days they were marching on the plains of italy.
"the man who has made up his mind to win," said napoleon, "will never say 'imposible.'"

Section – C

11. Write a paragraph on any one (1) of the following topics (200 words)

5

- a) If I were invisible for a day
- b) Five things I can't live without

12. Compare and contrast public university and private university and write a passage on it. (150 words)

5

13. Write an inquiry letter asking information for admission to the Master's program of MBA/CE at the University of Asia Pacific, 74/A, Green Road, Dhaka

5

Or

Write a claim letter to the United Airlines, who misplaced one of your bags on your flight from kolkata to Dhaka on January 15, 2016.

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination Fall – 2015
Program: B. Sc Engineering (CE)

Course Title: Physics I
Time: 3.00 Hours

Course Code: PHY-101

Credit: 3.00
Full Marks: 150

[N.B- The figures in the right margin indicate marks. There are two sections in the question paper namely "SECTION A" and "SECTION B". Answer from both sections according to the instruction mentioned in each section.]

SECTION A

There are **FOUR** questions. Answer any **THREE**

1. (a) Prove that the differential equation of a progressive wave can be written as [15]

$$\frac{d^2 y}{dt^2} = v^2 \frac{d^2 y}{dx^2}$$

where v is the velocity and y is the displacement of the wave.

- (b) A particle executes simple harmonic motion given by the equation $y = 12 \sin\left(\frac{2\pi t}{10} + \frac{\pi}{4}\right)$, [10]

calculate (i) amplitude, (ii) frequency, (iii) displacement at $t = 1.25$ s, (iv) velocity at $t = 2.5$ s (v) acceleration at $t = 5$ s.

2. (a) What is Lissajous' figure? Deriving the following equation, find out different types of Lissajous' figures. [15]

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{2xy}{ab} \cos\delta = \sin^2\delta$$

Where δ is the phase difference between the two waves.

- (b) Two tuning forks A and B are of nearly equal frequencies. Frequency of A is 256. When the two tuning forks are used to obtain Lissajous' figures, the complete cycle of changes takes place in 10 seconds. When the tuning fork B is loaded with a little wax, the time taken is 20 seconds. Calculate the frequency of B before loading. [10]

3. (a) Discuss about how Laplace made correction to Newton's formula and prove that the equation of Laplace's correction to Newton's formula for velocity of sound in gas can be written as $V = \sqrt{\frac{\gamma P}{\rho}}$. Where P is pressure and ρ is density of the gas. [15]

- (b) Prove that the velocity of sound in air is related to absolute temperature by $v \propto \sqrt{T}$. [10]

4. (a) Derive the expressions for the apparent pitch due to Doppler effect when the observer moves towards and away from a stationary source and when observer is at rest and source is in motion. [15]

- (b) A motor car sounding a horn at a frequency of 100 hertz moves away from a stationary observer towards a rigid flat wall with a velocity of 36 km/hr. How many beats per second will be heard by the observer? [Velocity of sound = 350 m/s] [10]

[Turn over

SECTION B

There are **FOUR** questions. Answer any **THREE**

5. (a) Describe the construction and working principle of constant volume air thermometer. [15]
(b) State and explain the first law of thermodynamics. [10]
6. (a) Show that the work done for expanding the gas during an adiabatic process can be expressed by the equation $W = \frac{1}{1-\gamma}[RT_2 - RT_1]$, where the symbols have their usual meaning. [15]
(b) A motor car tyre has a pressure of 2 atmospheres at room temperature of 27°C . If the tyre suddenly bursts, find the resulting temperature. [10]
7. (a) Show that the work done for expanding the gas during an isothermal process can be expressed by the equation $W = RT \times 2.3026 \times \log_{10} \frac{P_1}{P_2}$, where the symbols have their usual meaning. [15]
(b) A quantity of air at 27°C and normal atmospheric pressure is suddenly compressed to half its original volume. Find the final pressure and temperature. [10]
8. (a) (a) Prove that the efficiency of the Carnot's heat engine in terms of temperature is given by the relation [15]
$$\eta = 1 - \frac{T_2}{T_1}$$
Where T_1 and T_2 are the temperatures of source and sink respectively.
(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]

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination Fall – 2015
Program: B. Sc Engineering (CE)

Course Title: Physics I
Time: 3.00 Hours

Course Code: PHY-101

Credit: 3.00
Full Marks: 150

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University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall- 2015
Program: B. Sc Engineering (Civil)
(1st Year/ 1st Semester)

Course Title: Mathematics-I

Course Code. MTH 101

Time: 3.00 Hours

Full Mark:150

N.B: There are **Eight** questions. Answer any **Six (6)** of the following:

1. (a) Define Continuity and Differentiability. If 15

$$f(x) = \begin{cases} 1 + 2x, & -\frac{1}{2} \leq x < 0 \\ 1 - 2x, & 0 \leq x < \frac{1}{2} \\ -1 + 2x, & x > \frac{1}{2} \end{cases}$$

Find (i) $\lim_{x \rightarrow 0} f(x)$ and (ii) $\lim_{x \rightarrow \frac{1}{2}} f(x)$ if exists.

- (b) If $y = \sin(\sin x)$, then show that $y_2 + y_1 \tan x + y \cos^2 x = 0$ 10
2. (a) State Leibnitz's theorem. If $y = \sin(\sin^{-1} x)$, then show that 15
 $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 - a^2)y_n = 0$
- (b) If $u = \sin^{-1} \frac{y}{x} + \tan^{-1} \frac{x}{y}$, then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$ 10
3. (a) State and prove Euler's theorem on Homogeneous Functions in two variables. 13
- (b) Find the minimum value of x^x . 12
4. (a) Define Taylor's theorem with Cauchy's form of Remainder. Expand the function $(x + h)^m$ in powers of h with remainders $R_n(h)$ in Lagrange's and Cauchy's form. 17
- (b) If R be a region bounded by $x = 1, x = 4, y = -1$ and $y = 2$, then 8
 evaluate $\iint_R (2x + 6x^2 y) dy dx$

5 (a) Evaluate the improper integral 8+7

(i) $\int_{-\infty}^{\infty} \frac{x dx}{x^4+1}$ (ii) $\int_0^{\infty} x e^{-x^2} dx$

(b) Evaluate the definite integral 10

$$\int_0^2 \frac{dx}{4+3\sin x}$$

6 (a) Evaluate: 7+6+7

(i) $\int \sqrt{\frac{x}{a-x}} dx$ (ii) $\int (\ln \sqrt{x})^2 dx$ (iii) $\int e^x \frac{x^2+1}{(x+1)^2} dx$

(b) State First fundamental theorem of Calculus. 5

7 (a) Establish a reduction formula for $\int x^n e^{ax} dx$ and find $\int x^2 e^{ax} dx$. 12

(b) Find the radius of curvature at $x = \frac{\pi}{2}$ of the curve $y = 4\sin x - \sin 2x$. 8

(c) Evaluate: 5

$$\int \frac{e^x dx}{e^{2x} + 2e^x + 5}$$

8 (a) Define Gamma and Beta Function. Prove that, 13

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

Then prove that,
$$\int_0^{\frac{\pi}{2}} \sin^p \theta \cos^q \theta d\theta = \frac{\Gamma(\frac{p+1}{2}) \Gamma(\frac{q+1}{2})}{2\Gamma(\frac{p+q+2}{2})}$$

(b) Find the area of the region that is enclosed between the curves $y = x^2$ and $y = x + 6$. 12

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2015
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Mechanics I
 Time: 3 hours

Course Code: CE 101(A)
 Full Marks: (5+5) x10 = 100

PART-1

There are 6 questions. Answer any 5 questions.

(5x10=50 marks)

1. For the beam shown in Figure 1, calculate the following:
 (i) Reactions at supports A and D, (ii) Shear force at section 1-1.

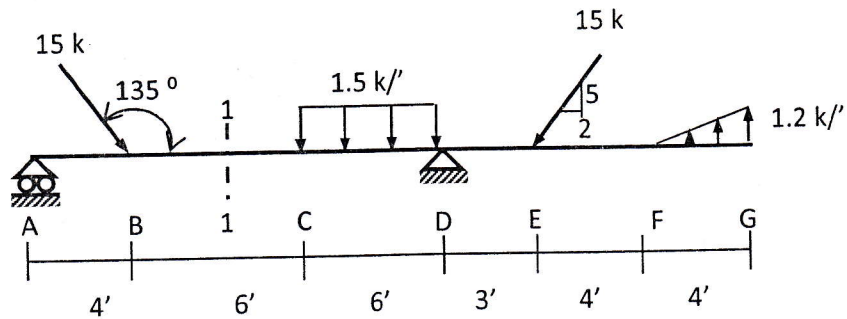


Figure 1

2. (a) Calculate the maximum tension in member AC for the truss ABC shown in Figure 2(a). Also calculate the corresponding angle θ and the force in member AB.

7

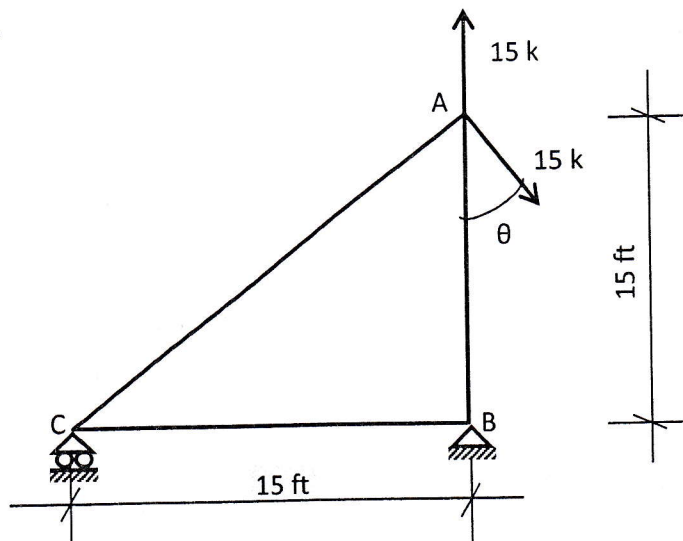


Figure 2(a)

2. (b) Draw the free-body diagram of the sphere in Figure 2(b). Weight of the sphere = W

3

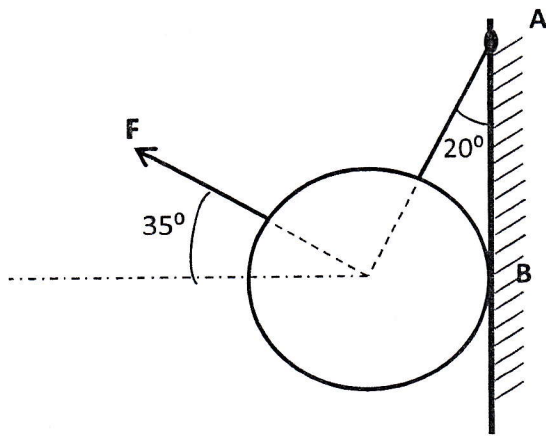


Figure 2(b)

3. For the frame shown in Figure 3, Calculate (i) the reactions at the supports, (ii) the force in the member DE. Neglect the self-weight of the members.

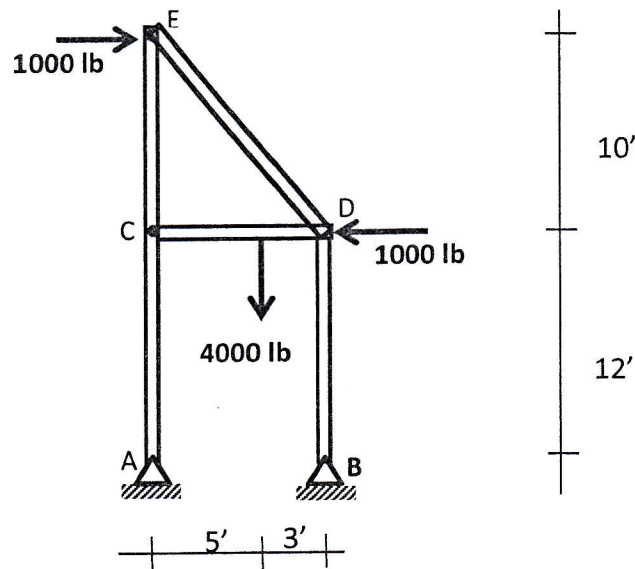


Figure 3

4. For the truss shown in Figure 4, determine the support reactions and the forces in the members CB, BF and FG.

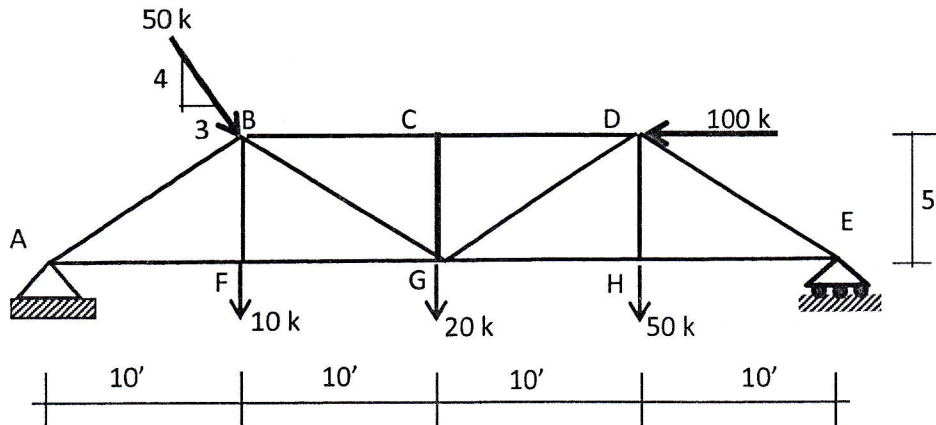


Figure 4

5. For Figure 5, $\Sigma F_x = -714.6$ N, and $\Sigma F_y = -206.7$ N. Calculate the following:
- Resultant (magnitude, line of action and direction)
 - Force F_1
 - Angle α
- Also determine the magnitude of the resultant (R), if $F_1 = 0$

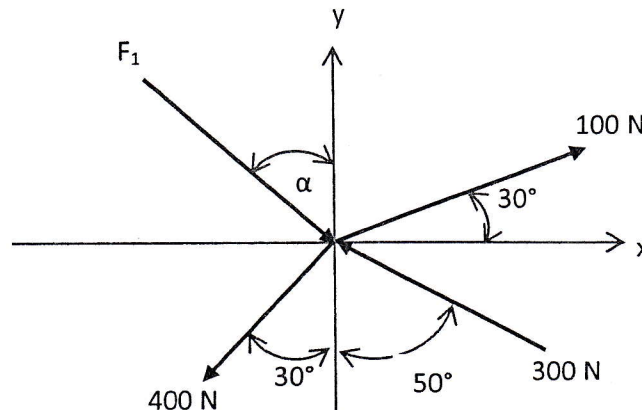


Figure 5

6. Given that self weight of member AB is 70 lb. (i) Calculate the weight 'W', and the angles α and β , shown in Figure 6, for equilibrium condition. (ii) Also calculate the bending moments at the mid section of the member AB, and at the point where 50 lb force is acting.

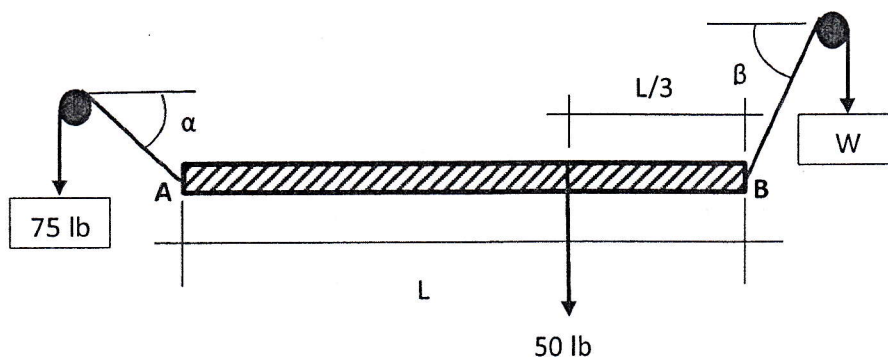


Figure 6

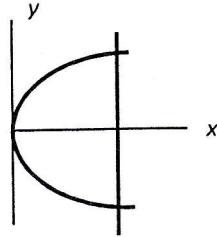
PART-2

There are 6 questions. Answer any 5 questions.

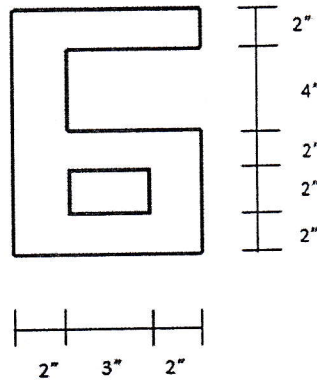
(5x10=50 marks)

Answer any 5 (Five) of the following 6 questions

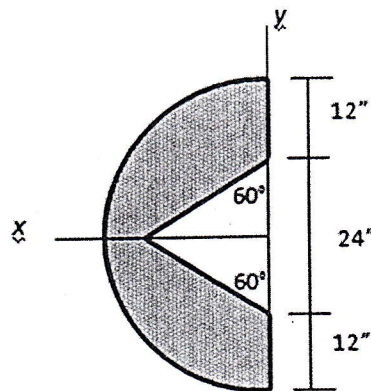
1. An area is bounded by the parabola $y^2 = 8x$ and the straight line $x = 5$ in. Determine by integration the centroid of this area.



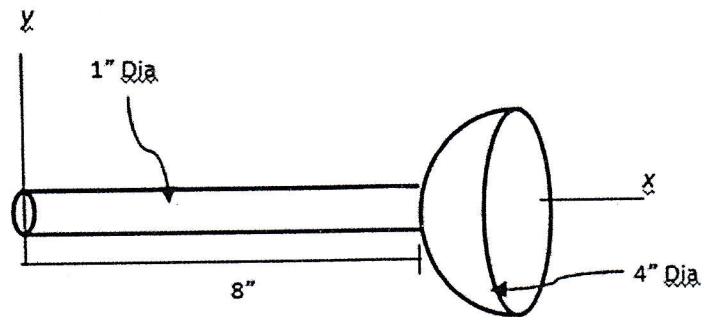
2. Determine the centroid of the following composite area.



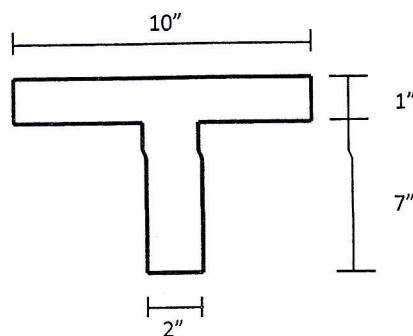
3. Determine \bar{x} for the shaded area shown below.



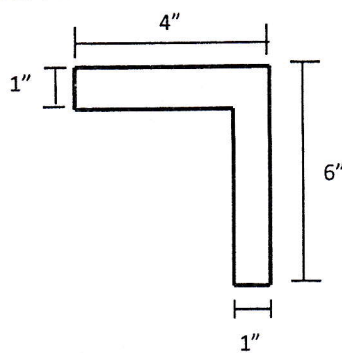
4. A homogeneous rod and a hemispherical part of the same material are welded together as shown below. Determine the location of center of gravity of this composite body.



5. Find the moment of inertia of a T-section shown below about its centroidal x axis.



6. For angle section shown in Fig below has $\bar{I}_x = 30.8 \text{ in}^4$ and $\bar{I}_y = 10.8 \text{ in}^4$ and $\bar{P}_{xy} = -10 \text{ in}^4$. Determine the minimum radius of gyration.



University of Asia Pacific
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Final Examination Fall 2015
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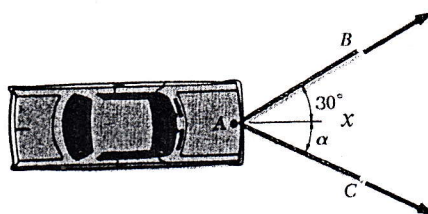
Course Title: Engineering Mechanics I
 Time: 3 hours

Course Code: CE 101(B)
 Full Marks: (5+5) x10 = 100

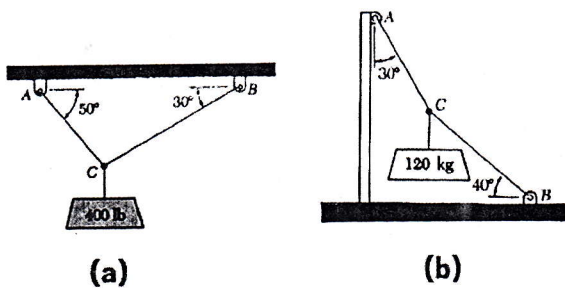
PART-1

There are 6 questions. Answer any 5 questions. (5x10=50 marks)

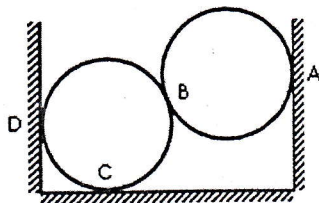
1. A disabled car is pulled by means of two ropes as shown. The tension in AB is 400 lb and the angle α is 20° . Knowing that the resultant of the two forces applied at A is directed in x-axis, determine (a) the tension in rope AC, (b) the resultant.



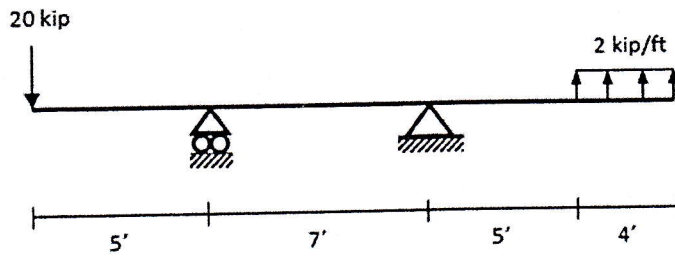
2. Two cables are tied together at C and loaded as shown. Determine the tension in AC and BC



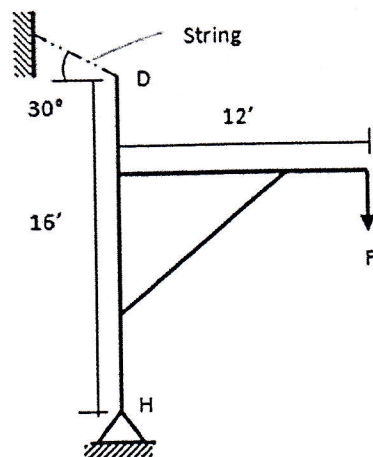
3. Two smooth spheres, each of radius 100 mm and weighing 100 N, rest in a horizontal channel having vertical walls, the distance between which is 360 mm. Find the reactions at the points of contact of A, B, C & D.



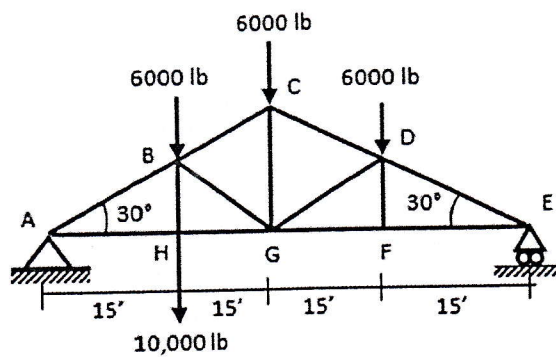
4. In the beam shown below calculate the support reactions.



5. The framework of a crane is shown below. It is supporting a load of $F = 5000$ lb. What are the reactions at H (components) and D if the weights of the members are neglected?



6. For the truss shown below, determine the external reactions and forces in member CD , DG and GH .



PART-2

There are 6 questions. Answer any 5 questions.

(5x10=50 marks)

- Find the length (l) and the inclination angle (α) of the straight line so that point 'O' becomes the centroid of the composite lines. Diameter of the semi-circle is 10 inch.

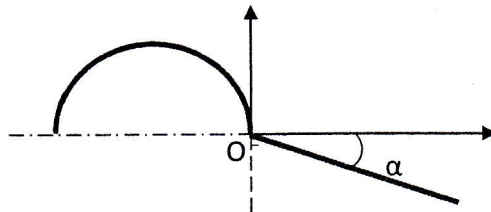


Figure 1

- Determine the co-ordinates of the centroid of the shaded area, shown in Figure 2. Radius of the semi-circle is 15''.

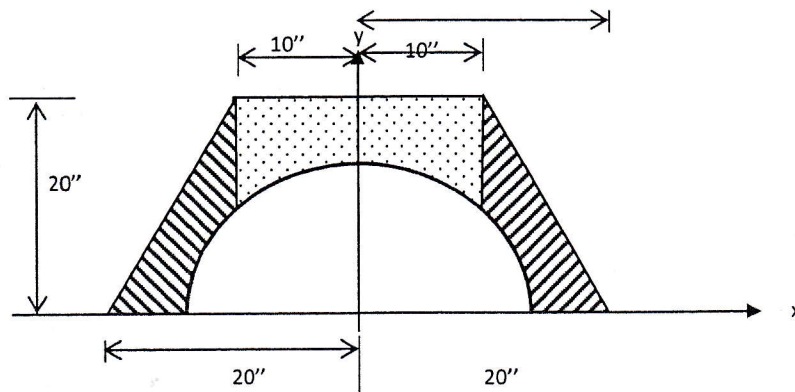


Figure 2

- A flexible cable, strung between two supports, is carrying 3 lb/ft due to external load and self weight. One support is 50 ft higher than the other. The sag, measured from the lower support, is 20 ft. The tension in the lower support is 12000 lb. Calculate the following:
 - Distance between the two supports
 - Total length of the cable
 - Slope in degree at the upper support
- For the area enclosed by the two parabolic curves ($y^2 = 16x$ and $x^2 = 16y$), calculate the following:
 - X-co-ordinate of the centroid
 - Moment of inertia about x-axis (I_x)

The intersecting points of the parabolic curves are (0, 0) and (16, 16).

5. For Figure 3, calculate the following
- the product of inertia (P_{xy}),
 - the angle of rotation of the centroidal axes system, where I is minimum,
 - I_{minimum}
 - Minimum radius of gyration (k_{min})

Given data:

The centroid is located at $(1.05'', 4.95'')$.

I_x (about centroidal x-axis) = 69.6 in^4

I_y (about centroidal y-axis) = 11.6 in^4

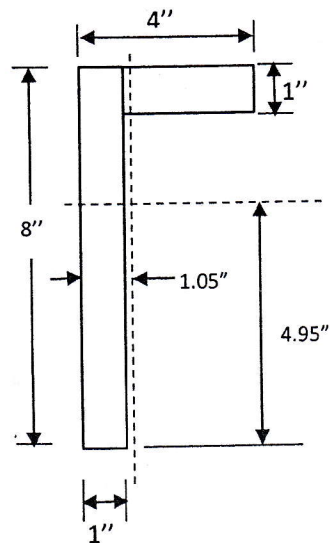


Figure 3

6. Determine the moment of inertia of the shaded section (shown in Figure 4), about horizontal axis through the centroid.

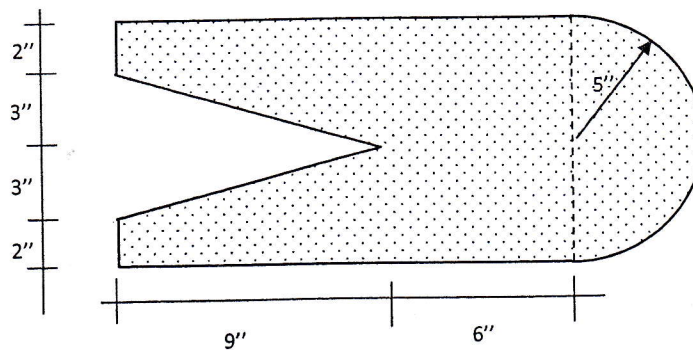


Figure 4

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2015
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)

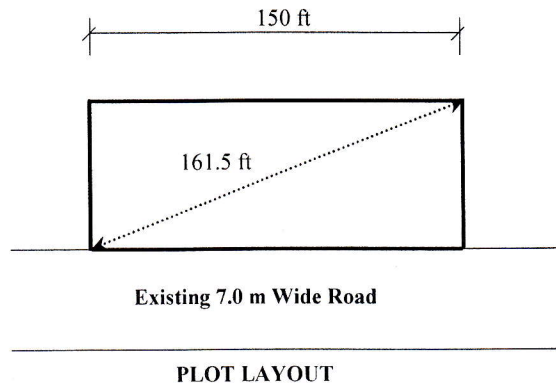
1. (a) Define the term *Environment* and *Environmental Pollution*. [5]
 (b) Mention some controls measures for industrial pollution. [10]
 (c) Define biodiversity. Why it is needed to protect? Mention the causes that threat biodiversity. [10]
2. (a) Point out some recent global environmental issues. [5]
 (b) Write short notes on ii) Trans-boundary pollution ii) Natural and Cultural Eutrophication [10]
 (c) Describe the relationship between Human and Environment. [10]
3. (a) Write down some examples of Ecosystem service value of biodiversity. [5]
 (b) Describe *3R principles*. [10]
 (c) Define the term *Air Pollution*. Mention the names of some major air pollutants. [10]

PART II

There are **4** questions. Question **4** is mandatory. In addition, answer any **2** among questions **6** through **7**. (20+15 x 2 = 50)

4. A 3-storied residential building is to be constructed. Estimate the total construction cost as per the following particulars and specifications of the building. Use PWD schedule and other relevant information provided in the attached appendix. 20

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)	4.0 ksf
04	Floor Level	Three
05	Plinth Area	57 % 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	1200 Gallons
09	Structure type	RCC Frame Structure
10	Underground water reservoir & Misc	3000 gallons
11	Boundary wall	RCC frame
12	Incidental Cost	Consider 8% for this building



5. (a) Mention three simple points (each) related to the understanding of science, engineering and technology. 9
 (b) Briefly discuss “Civil Engineering” as a career. 6

6. (a) Define civil engineering according to ASCE. 3
 (b) Give the names in details of the following codes with their related fields. 3
 (i) BNBC (ii) AASHTO (iii) ACI
 (c) Define plane and geodetic surveying. 4
 (d) Mention (names only) few types of loads to be considered in design. 5

7. (a) What are the major factors for choice of building materials? 2
 (b) What are the major foci of any civil engineering project? 3
 (c) For the following conditions, find the total floor area and the number of stories that can be built for a residential building. 10
 - a. Plot size: 15 m x 20 m
 - b. Road width = 6 m
 - c. FAR = 3.5
 - d. MGC = 62.5%
 - e. Minimum back setback: 2.0 m
 - f. Minimum side setback: 1.25 m
 - g. Minimum front setback: 1.5 m