Course Title: Engineering Mechanics I   Course Code: CE 101
Time: 3 hours   Full Marks: 100

Part 1
There are 6 questions. Answer any 5 questions.   **(5x10=50 marks)**

1. Calculate the following for the beam shown in Figure 1,
    (i) the reactions at supports A and D, (ii) the bending moments at B and E
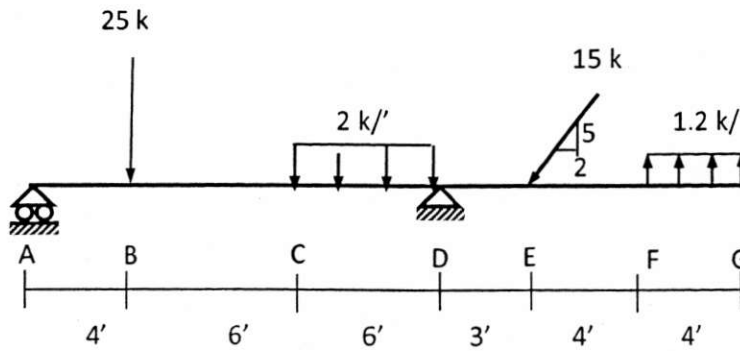

Figure 1

2. The body A shown in Figure 2 weighs 180 lb. Calculate the minimum force F needed to keep
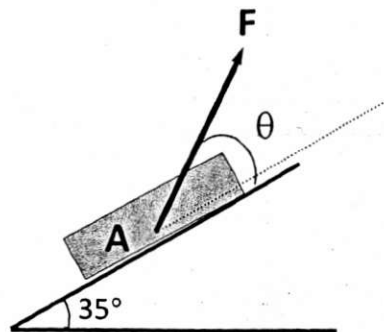   it in equilibrium. Also calculate the corresponding angle θ and reaction of the plane.

Figure 2

3. For the structure shown in Figure 3, (i) Calculate the force in cable EH,
   (ii) Identify the two force member and determine the magnitude of that force,
   (iii) Draw the free-body diagrams of members ABCD and EFDG.
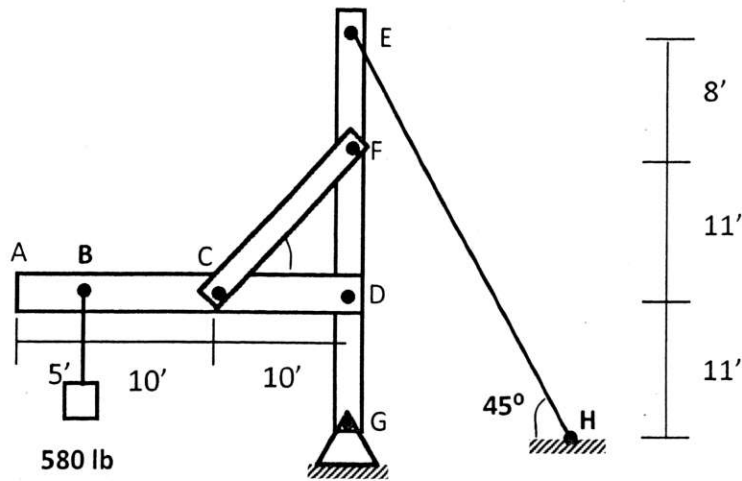   Neglect the self-weight of the members.

Figure 3

4. For the truss shown in Figure 4, determine the support reactions and the forces in
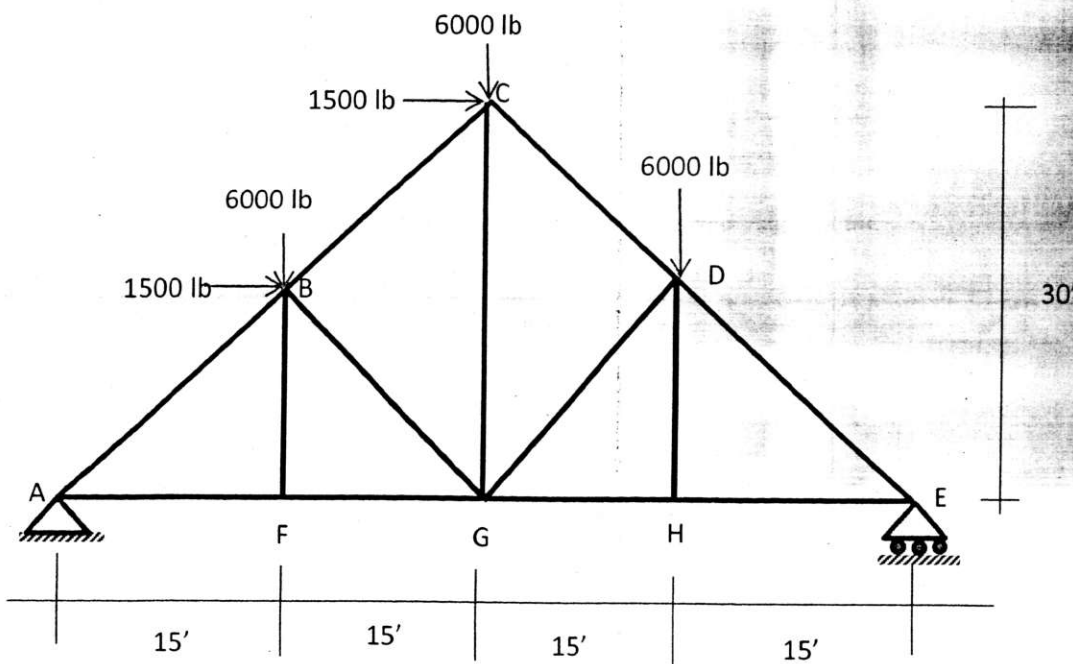   the members CD, GH and DG.

Figure 4

5. In the figure below, the object A (weighing 15 k) is being lifted vertically upwards by the combined effect offour forces. Calculate the force in the cable AB and the angle θ. The pulley C is smooth.
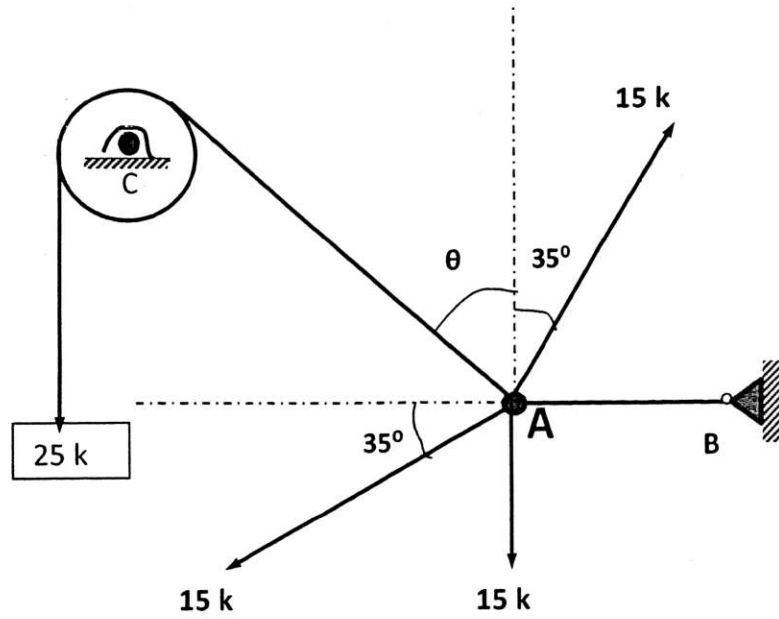

Figure 5

6. Calculate the reactions at the supports A and B of the beam shown in Figure 6. Also calculate the shear forces at C and D.

Figure 6

7. Locate the centroid of the area included between the parabola $x^2 = 4y$ and the line $x = 9$.
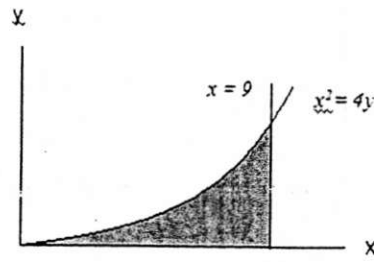
8. Determine $\bar{x}$ for the shaded area shown below.
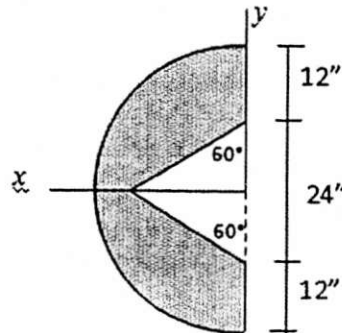
9. A homogenous rod and a hemispherical part of the same material are welded together, as shown. Where is the center of gravity of this composite body from the y-axis shown?
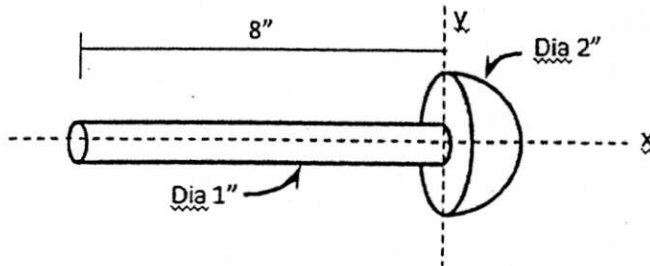
10. In the standard structural steel angle section shown in figure, $a = 1$ in., $b = 2$ in. and $c = 5$ in. Find the centroidal moments of inertia
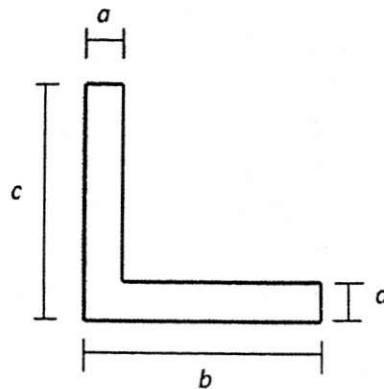
11. Find the moment of inertia about the axis M-M as shown for the following section.
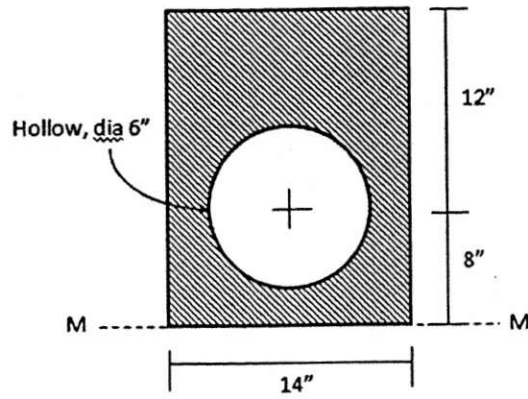
12. For angle section shown in Fig below has $\bar{I}_x = 30.8$ in^4 and $\bar{I}_y = 10.8$ in^4 and $\overline{P_{xy}} = -10$ in^4. Determine the minimum radius of gyration.
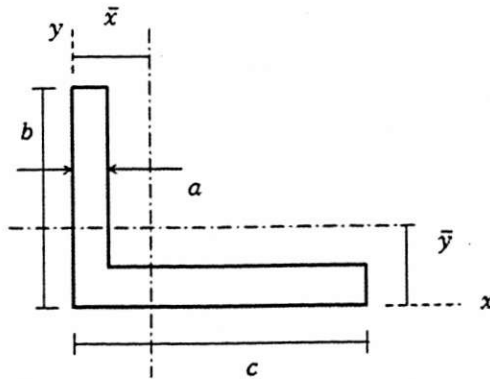
Course Title: Introduction to Civil and Environmental Engineering   Course Code: CE 107
Time- 2 hours   Full marks: 100

PART I

There are **THREE** questions. Question **1** is mandatory. In addition, answer any **ONE** between questions **2** and **3**. *(25+25 = 50)*

1. (a) What types of disasters are common in Bangladesh? What are the main pressures/causes of disasters? Mention the major impacts associated with these disasters. (12)

   (b) List the "Criteria Air Pollutants". Mention the specific impacts of air pollution. (8)

   (c) What is eutrophication? Show certain ways of cultural eutrophication. (5)

2. (a) The measured dimensions of a rectangle are 9.70 cm and 4.25 cm. Find out the area of the rectangle in ft^2. (3)

   (b) Write short notes on (i) Acid Rain and (ii) Environmental degradation (6)

   (c) Show certain ways of reducing your footprints on earth. (6)

   (d) What is the difference between inundation and water logging? Discuss the problems that have been caused by degradation of wetlands. (4+6)

3. (a) Define food chain. What are the basic characteristics of an ecosystem? (2+4)

   (b) Define point and non-point sources of pollution with at least three (3) examples for each. (6)

   (c) Describe green house gas effect. What are the possible effects of a warmer world? (10)

   (d) List the major river networks in Bangladesh. Which one is the longest network? (3)

PART II

There are **6** questions. Question **4** is mandatory. In addition, answer any **3** among questions **5** through **8**. *(14+12 x 3 = 50)*

4. A Five-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. **14**

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)	2.5 ksf
04	Floor Level	Five
05	Plinth Area	62 % 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 supports etc	1800 Gallons
09	Structure type	RCC Frame Structure
10	Underground water reservoir, distribution line, water pump, pump house, WASA charge	5000 gallons
11	Boundary wall	RCC frame
12	Incidental Cost	Consider 7% for this building

PLOT LAYOUT
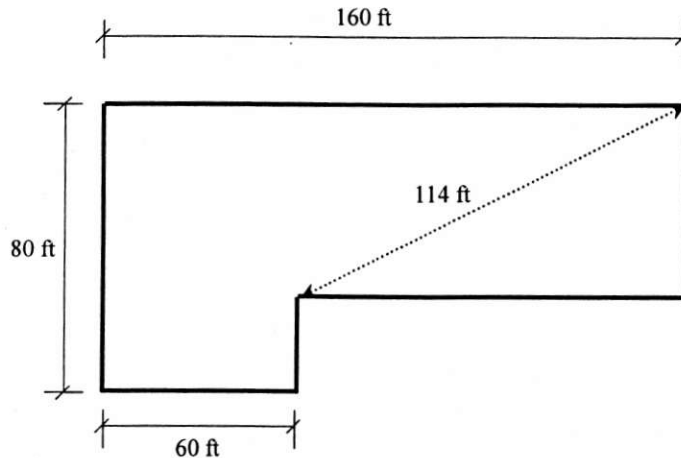
5. (a) Mention three simple points (each) related to the understanding of science, engineering and technology. **9**

   (b) What are the major foci of any civil engineering project? **3**

6.	(a) Define civil engineering according to ASCE. What are the major branches of civil engineering? 5

(b) Give the names in details of the following codes with their related fields. 3
   (i)	BNBC	(ii) ASTM	(iii) ACI

(c) Categorize building based on type of occupancy. 4

7.	(a) What are the major factors for choice of building materials? 2

(b) Define plane and geodetic surveying. 4

(c) Classify surveying based on objects of survey and instruments used. 6

8.	(a) Mention (names only) few types of loads to be considered in design. 3

(b) For the following conditions, find the total floor area and the number of stories that can be built for a residential building. 9

   a.	Plot size: To be determined from plot layout as shown below
   b.	Existing road is to be widened to 9.0 m
   c.	FAR = 3.0
   d.	MGC = 57%
   e.	Minimum back setback: 2.0 m
   f.	Minimum side setback: 1.25 m
   g.	Minimum front setback: 1.5 m

150 ft

161.5 ft

Existing 7.0 m Wide Road
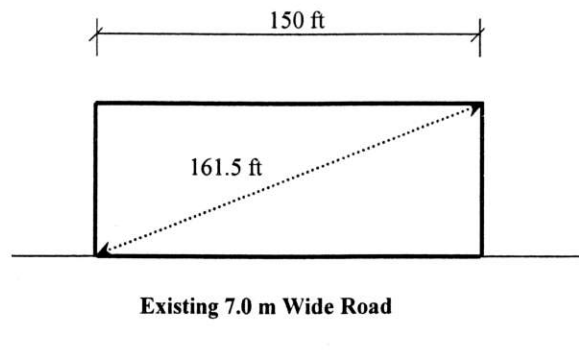
PLOT LAYOUT

APPENDIX
PWD SCHEDULE
1. Foundation Cost upto PL (per m^2)

Storey	q_a = 2 ksf	q_a = 2.50 ksf	q_a = 3.0 ksf	q_a = 3.5 ksf	q_a = 4.0 ksf	q_a = 4.5 ksf	q_a = 5.0 ksf
1	3982	3875	3811	3769	3740	3718	3702
2	4684	4381	4199	4080	3997	3936	3830
3	5591	5036	4702	4482	4329	4217	4133
4	6566	5811	5296	4958	4723	4551	4421
5	8001	6774	6035	5550	5212	4965	4778
6	9495	7851	6862	6213	5759	5429	5178
7	10961	8908	7673	6862	6296	5883	5571
8		10043	8544	7560	6873	6371	5992
9		11252	9471	8302	7487	6891	6441
10		12529	10451	9088	8136	7441	6915

2. Superstructure Cost (per m^2)

		Building Category											
		Non-Residential (fc=19-21 MPa, Brick Chips)			Residential (fc=19-21 MPa, Brick Chips)			Non-Residential (fc=22-25 MPa, Stone Chips)			Residential (fc=22-25 MPa, Stone Chips)		
Level	Floor	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior
0	GF Park	5449	5812	6538	5634	6010	6761	5922	6317	7107	6124	6532	7349
0A	Habitation	8545	9601	12674	8837	9929	13106	9020	10135	13378	9631	10792	14274
1	1 st Floor	8242	9360	12224	8523	9576	12640	8699	9776	12903	9289	10409	13767
2	2nd Floor	8365	9399	12407	8651	9720	12830	8830	9921	13096	9568	10565	14180
3	3 rd Floor	8491	9540	12593	8780	9866	13023	8962	10070	13293	9855	10723	14606
4	4 th Floor	8618	9683	12782	8912	10014	13218	9097	10221	13492	10151	10884	15044
5	5 th Floor	8748	9829	12974	9046	10154	13416	9233	10374	13694	10455	11046	15495
6	6 th Floor	8835	9927	13104	9136	10265	13550	9326	10478	13831	11030	11158	15960

SOME ADDITIONAL COSTS

3. Boundary Wall: Tk.3500/m
4. External Water Supply: Tk.60.00/gallon
5. Gas Connection:

GF: Tk.260/sqm
Other floors: Tk.100/sqm

6. Internal Electrification:
(ii) Residential Building
Economy: Tk.1030 /sqm
Standard: Tk.1290 /sqm
Superior: Tk.1550 /sqm
(ii) Non-Residential Building:
Economy: Tk.775 /sqm
Standard: Tk.970 /sqm
Superior: Tk.1160/sqm

7. Internal Sanitary and Water Supply:
(i) Residential Building
Economy: Tk. 475 /sqm
Standard: Tk.715 /sqm
Superior: Tk. 1070 /sqm
(ii) Non-Residential Building
Economy: Tk.360 /sqm
Standard: Tk.540 /sqm
Superior: Tk.800 /sqm

8. Floor Finish Work: Tk.1000.00/ sqm
9. Roof top RCC water Tank: Tk.85.00/gallon

University of Asia Pacific

Department of Civil Engineering

Final Examination Spring 2015

Program BSC Engineering (Civil)

Course Code: HSS101   **Course Title: English Language I**

Time: 3Hours   Full Marks: 50

1. Read the passage and answer <u>any five</u> of the questions that follow: **1x5=5**

The people of ancient Egypt emerged as one of the first Western civilizations. Sustained by the River Nile and protected by vast deserts, the Egyptians lived in comparative security, prosperity and peace for thousands of years. When such conditions exist, the civilization and its arts usually flourish. To this day, many of the Egyptian artistic creations display the wealth, splendour and talent of this great civilization.

Ancient Egypt has been called a land of temples and tombs. For centuries people have been filled with wonder at the ingenuity of the Egyptians, whose impressive works have withstood the ravages of time so well. Had it not been for the long-lasting nature of their monuments and carved inscriptions in the form of hieroglyphics', much evidence of their activities would have vanished from all historical records. In about 3000 BC, Upper and Lower Egypt were united under the first pharaoh, and generally from that time until the invasion by Alexander the Great in 332 BC, Egypt prospered as a nation of skilful craftsmen and artists.

The Egyptians were an industrious, highly civilized and deeply religious people, who obediently accepted the supreme authority of their pharaohs. The people were content to serve and work for the state in return for a secure livelihood. They considered this earthly life to be a segment in a great cycle, at the end of which everything would be returned to its original form. The richer and more important the person, the more careful and elaborate would be his or her burial, and the stronger and safer the tomb in which they would be buried.

The burial of the dead in the ground was not considered sufficiently safe for kings, queens and court officials, so sunken, sealed tombs were ingeniously constructed to protect personal treasures, food and instructions for the safe conduct of the soul after death. The design of these tombs developed into the stepped pyramid, and finally into the square pyramid that we know today.

There are about 80 ancient pyramids in Egypt. The Great Pyramid at Giza, which King Cheops built as his tomb 5000 years ago, holds most interest. It stands with two other pyramids on a slight rise overlooking the River Nile. At the centre of the pyramid is the King's Chamber and leading down from there is a long narrow area known as the Grand Gallery. The pyramid covers 13 acres and contains 2,300,000 blocks of limestone, each weighing an average of 1.5 tons. Its pyramidal form has a perfectly square base with sides of 756 feet and a height of 481 feet. Situated directly below the King's Chamber is the Queen's Chamber and there are two air channels leading upwards from the centre of the pyramid to the outside.

a. Why did the Egyptian civilization flourish?

b. What represents the richness of the Egyptian civilization?

c. Why haven't the evidence of their activities vanished from the historical records?

d. How were the kings and queens buried?

e. What are the qualities of the Egyptians?

f. Describe the great pyramid.

2. Translate the following text to English: 5

অনেক অনেক দিন আগে ডিডালাস নামে এক গ্রীক শিল্পী ছিল। দেশে দেশে সবাই তার সৃষ্টিকর্মের প্রশংসায় ছিল পঞ্চমুখ। তার ছিল এক মা হারা ছেলে নাম ইকারাস। ডিডালাস এক দেশ থেকে আরেক দেশে ঘুরে বেড়াতে পছন্দ করতো আর এভাবেই তার সৃষ্টিকর্ম ছড়িয়ে পড়তো দেশ থেকে দেশান্তরে। এইভাবে দেশ ঘুরতে ঘুরতে ডিডালাস আর ইকারাস এসে পৌছায় ক্রিট রাজ্যে। ক্রিট রাজ্যের রাজা তখন মাইনোস। মাইনোস ছিল অত্যন্ত বদরাগি ও নিষ্ঠুর প্রকৃতির মানুষ। কিন্তু ডিডালাসকে সে অনেক সমীহ করে খুশি মনে আমন্ত্রন জানায় তার রাজ্যে। খুব অল্প সময়ের মধ্যেই ডিডালাস তার শিল্পের সুনাম ছড়াতে থাকে।

3. a. Narrate how you spend a holiday. (at least 150 words)   5

Or,

b. Write about five important things of your life. (at least 150 words)

4. Do you agree that the children of the modern generation are becoming lazy? Explain why in at least 250 words.   10

5. Fill in of the blanks with appropriate parts of speech.   5 × 2 = 10

a) In order to _____ (reduction) unemployment problem, new job sectors must be created _____ (immediate)

b) There is a huge _____ (different) between _____ (educate) persons and ignorant persons

c) Did Sara _____ (memory) all the answers? It would be _____ (fool) not to.

d) In order to _____ (strength) one's ambition, one must have a _____ (courage) heart.

e) The sofa was so _____ (soften) that I fell_____ (sleep).

6. Use the suffix/prefixes **en-, be-, dis-, -ify, -ise, -ment, -al, -ive, -ly** to <u>any five</u> of the following words and make sentences with the newly formed words: **5x1=5**

courage, engage, friend, beauty, body, agree, approve, attach, accomplish

7. Use <u>any five</u> the following words as homographs in two separate sentences: **5x1=5**

Fair, watch, desert, play, change, mind, match, lead

8. Read the following passage and use proper punctuation marks where necessary: **5**

music can be compared to language in some respects it combines easily with actual language it also speaks a language of its own it is called universal language music has its organizing factors of rhythm melody harmony colour and form language also has those elements music has its own alphabets of seven letters in case of the english language there are twenty six letters of the alphabet for example each of these letters represents a note as in language certain letters are complete words in themselves

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

Course Title: Mathematics I   Course Code: MTH 101
Time: 3 hr   Credit: 3.00   Full Marks: 150

N.B.: Answer 6 questions taking any 3 questions from each group. Figures in the right margin
indicate the marks of the respective questions.

GROUP-A

1. (a) State and prove Lagrange's mean value theorem (MVT).   12.5

    (b) Verify this theorem for $f(x) = x^3 + x + 4$ on the interval [-1, 1].   12.5

2. (a) State and prove Cauchy's mean value theorem (MVT).   12.5

    (b) Verify Cauchy's mean value theorem for $f(x) = x^3 - 3x^2 + 4$ and   12.5
         $g(x) = x^2 - x - 2$ on the interval [1, 2].

3. (a) Let $f(x) = 3x^3 - 4x + 1$. Find the intervals on which the function $f(x)$ is   15
         (i) increasing, (ii) decreasing, (ii) concave up and (iv) concave down.

    (b) Define relative extrema. Find the relative extrema of $f(x) = \sin x\,(1 + \cos x)$.   10

4. (a) State Taylor's theorem with remainder. Use Taylor's theorem to expand   12.5
         $f(x) = \cos x$ in powers of $\left(x - \dfrac{\pi}{2}\right)$ with the remainder term.

    (b) State and prove L' Hospital's rule. Apply this rule to evaluate   12.5

$$\lim_{x \to 0} \left(\frac{\ln(\cos x)}{\ln(\cos 3x)} \right).$$

GROUP-B

5. (a) Evaluate the following indefinite integrals: 25

    (i) $\displaystyle\int_0^{} \frac{dx}{5 + 4\cos x}$ (ii) $\displaystyle\int \frac{dx}{\left(e^x + e^{-x}\right)^2}$ (iii) $\displaystyle\int \tan^4 x\, dx$

    (iv) $\displaystyle\int \frac{dx}{2x^2 + x + 1}$ (v) $\displaystyle\int \frac{dx}{\sqrt{(x - 2)(3 - x)}}$

1

6. (a) State and prove the fundamental theorem of calculus. 10

(b) Evaluate the following definite integrals: 15

(i) $\int\limits_0^1 \left(\sqrt{x} - e^{3x} \right) dx$ (ii) $\int\limits_{-4}^2 \left(x^5 - 3 \right) dx$ (iii) $\int\limits_0^{\frac{\pi}{2}} \dfrac{dx}{3 + 2\cos x}$

7. (a) Define reduction formula. Find a reduction formula for $\int x^n e^{ax} dx$. 15

Hence evaluate $\int x^3 e^{2x} dx$.

10

(b) Find a reduction formula for $\int \sin^n x \, dx$

8. (a) Find the area of the region enclosed by the curves $y^2 = 4ax$ and $x^2 = 4ay$ 12.5

(b) Find the area of the region that is inside the cardioids $r = 4 \left(1 + \cos\theta \right)$ and outside the circle $r = 6$.   12.5

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

Course Title: Physics I	Course Code: PHY-101	Credit: 3.00
Time: 3.00 Hours		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) Derive the expressions for the apparent pitch when the observer moves towards and away from a stationary source and when observer is at rest and source is in motion. **[15]**

   (b) Two trains traveling in the opposite direction at 100 km/hr each, cross each other while one of them is whistling. If the velocity of sound is 340 m/s and frequency of the note is 800 Hz, find the apparent pitch as heard by an observer in the other train: **[10]**
   (i) before the trains cross each other (ii) after the trains have crossed each other

2. (a) Derive that the relation of Newton's formula for the velocity of sound in gas can be given by the relation $V = \sqrt{\dfrac{P}{\rho}}$. Where P and ρ are the pressure and density of the gas respectively. **[15]**

   (b) Discuss the effect of pressure on the velocity of sound in gas. **[10]**

3. (a) How can you prove that the total energy of the simple harmonic oscillator is given by **[15]**

   $$E = \frac{1}{2}kA^2$$

   where E is the total energy and A is the amplitude of the simple harmonic oscillator.

   (b) Show that for a particle executing simple harmonic motion, its velocity at any instant is $\dfrac{dy}{dt} = \omega\sqrt{a^2 - y^2}$. **[10]**

4. (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]**

[Turn over

5. (a) State and explain the laws: Zeroth law of thermodynamics, First law of thermodynamics, Second law of thermodynamics. [15]

(b) When a system is taken from the state A to state B along the path ACB, 80 joules of heat flows into the system and the system does 30 joules of work (fig. below). [10]
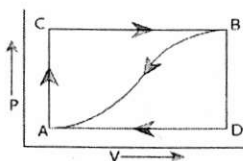
(i) How much heat flows into the system along the path ADB, if the work done is 10 joules?
(ii) The system is returned from the state B to the state A along the curved path. The work done on the system is 20 joules. Does the system absorb or liberate heat and how much?

(iii) If $U_A = 0$, $U_D = 40$ joules, find the heat absorbed in the process AD and DB.

6. (a) Show that the adiabatic curve is γ times steeper than that of isothermal curve at a point where the curves intersect each other. [15]

(b) A motor car tyre has a pressure of 2 atmospheres at room temperature of 30^0C. If the tyre suddenly bursts, find the resulting temperature. [10]

7. (a) Describe the construction and working principle of constant volume air thermometer. [15]

(b) A quantity of air at 30^0C and normal atmospheric pressure is suddenly compressed to half its original volume. Find the final pressure and temperature. [10]

8. (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 engine is operated between two reservoirs at temperatures of 450K and 350K. If the engine receives 1kJ of heat from the source in each cycle, calculate the amount of heat received by the sink and efficiency of the engine. [10]