

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination, Fall 2014**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Introduction to Civil & Environmental Engineering  
Time: 2.0 hours

Course Number: CE 107  
Full Marks: 100

**PART - I**

Question No. seven is compulsory. Answer any other four questions:

1. (a) Discuss, in brief, science, engineering and technology. (8)
2. (a) Define civil engineering according to ASCE and write a brief history. (8)
3. (a) Mention some (minimum six) of the important roles of civil engineers in the development of infrastructure. (4)  
(b) Mention few names of infrastructures that civil engineers are generally involved in development. (4)
4. (a) What are the major sub-disciplines of civil engineering? Mention some other sub-disciplines that are always inevitably participatory in any civil engineering project. (3)  
(b) Give the names in details of the following codes with their related fields. (2)  
(i) BNBC (ii) ASTM (iii) ACI (iv) AASHT  
(c) Categorize building based on type of occupancy. (3)
5. (a) Categorize construction materials based on specific property of material. What are the major factors for choice of materials? (2)  
(b) Mention (names only) few types of loads to be considered in design. (2)  
(c) Mention (names only) major components of a building. (4)
6. (a) Classify (mention categories only) surveying according to different criteria (4)  
(b) What is project surveying? Write down the common features to be considered under reconnaissance phase of a project surveying of a highway project. (1.5 + 2.5)
7. A Six-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. (18)

Sl No	Particulars	Specification
01	Land Size	25m x 35m
02	Building type	Residential (Standard)
03	Allowable Bearing Capacity ( $q_u$ )	3 ksf
04	Floor Level	Six
05	Plinth Area	350 Square meter
06	Construction Material	19-21 MPa, RCC Structure 1:1.5:3 (Brick Chips)
07	Ground Floor	Car Parking

Sl No	Particulars	Specification
08	Roof top RCC water tank including beams and	2500 Gallons
09	Structure type	RCC Frame Structure
10	Underground water reservoir, distribution line, water pump, pump house, WASA charge	7000 gallons
11	Boundary wall	RCC frame

### PART- II

Answer now five questions:

8. (a) What is renewable energy? Why do we call it as clean energy? (3)  
 (b) Name the water parameters, which should be examined for maintaining drinking water quality. (0.5x6=3)  
 (c) How can we reduce population growth of a specific area? (4)
9. (a) What is air pollution? Write down the name of air pollutants. (1+2=3)  
 (b) Define: Age Structure, Biomass, Autotrophs (3x1=3)  
 (c) Write down the factors that trend to increase biodiversity. (4)
10. (a) Write down the causes of acid rain due to reactions in the environment. (4)  
 (b) What are the advantages of installing wind turbine at coastal regions? Explain. (4)  
 (c) What is a catchment area? (2)
11. (a) Define: Water Footprint, Water Conservation (2x1.5=3)  
 (b) Write down the comparisons between biotic and abiotic? (3)  
 (c) What is a burner reactor? What are the main components of a burner reactor? (4)
12. (a) Name the major sectors of EPA Green Engineering Program. (2)  
 (b) What are the main requirements of a fusion process? (3)  
 (c) Write down the potential solutions of acid rain. (5)
13. (a) Define: Human Demography, Life Expectancy (2x1=2)  
 (b) Describe the major kinds of air pollution sources. (5)  
 (c) Write down the comparisons between wind power plant and tidal power plant. (3)
14. (a) Define: Nuclear Energy, Biodiversity (2x1=2)  
 (b) Briefly demonstrate the components of ecosystem. (4)  
 (c) Explain the relation of water head with power generate rate in a hydroelectric plant. (4)

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Fall 2014**  
**Program BSC Engineering (Civil)**

Course Code: HSS101

Course Title: English Language I

Time: 3Hours

Full Marks: 50

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1. Read the passage and answer the questions that follow:

2x5=10

*Animal Farm* is an allegorical and dystopian novella by George Orwell, first published in England on 17 August 1945. According to Orwell, the book reflects events leading up to the Russian Revolution of 1917 and then on into the Stalin era in the Soviet Union. Orwell, a democratic socialist, was a critic of Joseph Stalin and hostile to Moscow-directed Stalinism, an attitude that was critically shaped by his experiences during the Spanish Civil War. The Soviet Union, he believed, had become a brutal dictatorship, built upon a cult of personality and enforced by a reign of terror. In a letter to Yvonne Davet, Orwell described *Animal Farm* as a satirical tale against Stalin ("*un conte satirique contre Staline*"), and in his essay "Why I Write" (1946), he wrote that *Animal Farm* was the first book in which he had tried, with full consciousness of what he was doing, "to fuse political purpose and artistic purpose into one whole".

The original title was *Animal Farm: A Fairy Story*, though the subtitle was dropped by U.S. publishers for its 1946 publication and subsequently all but one of the translations during Orwell's lifetime omitted it. Other variations in the title include: *A Satire* and *A Contemporary Satire*. Orwell suggested the title *Union des républiques socialistes animales* for the French translation, which abbreviates to URSA, the Latin for "bear", a symbol of Russia, and which recalled the French name of the Soviet Union, *Union des républiques socialistes soviétiques*.

Orwell wrote the book from November 1943 to February 1944, when the wartime alliance with the Soviet Union was at its height and Stalin was regarded highly by the British people and intelligentsia, a circumstance that Orwell hated. It was initially rejected by a number of British and American publishers, including one of Orwell's own, Victor Gollancz. Its publication was thus delayed, though it became a great commercial success when it did finally appear partly because the Cold War so quickly followed World War II.

*Time* magazine chose the book as one of the 100 best English-language novels (1923 to 2005); it also featured at number 31 on the Modern Library List of Best 20th-Century Novels. It won a Retrospective Hugo Award in 1996, and is also included in the Great Books of the Western World selection.

- What is *Animal Farm* and what does it reflect?
- What are the various other titles of *Animal Farm*?
- Who was Orwell and what did he observe about the Soviet Union?
- What is "Victor Gollancz"?
- Do you think *Animal Farm* is famous? What according to the passage says so?

2. Translate the following text to English:

4

নোয়াখালী জেলার হাতিয়া উপজেলার ছোট্ট একটি দ্বীপ, নিঝুম দ্বীপ। নানান বৈচিত্রে ভরপুর এই দ্বীপ এখন বাংলাদেশের অন্যতম ভ্রমণ কেন্দ্র। এখানকার জাতীয় উদ্যানে আছে অসংখ্য চিত্রা হরিণ। নিঝুম দ্বীপের মতো দেশের অন্য কোন বলে কাছাকাছি থেকে এত বেশি চিত্রা হরিণ দেখা যায় না। শীতে নানান রকম অতিথী পাখি এই দ্বীপে বেড়াতে আসে। দ্বীপে পর্যটকদের খাওয়ার ভালো ব্যবস্থাও আছে। এই শীতে ভাই ঘুরে আসতে পারেন সুন্দর এই দ্বীপ থেকে। নোয়াখালী জেলার দক্ষিণাংশে, হাতিয়া উপজেলায় বঙ্গোপসাগরের মোহনায় জেগে ওঠা ছোট্ট দ্বীপ। কথিত আছে ওসমান নামের এক ব্যক্তি তার মহিষের পাল নিয়ে সর্বপ্রথম এই দ্বীপে নববসতি গড়ার পর তার নামেই দ্বীপটি পরিচিতি পায়। ৭০'এর দশকের পর দ্বীপের নামকরণ হয় নিঝুম দ্বীপ।

3. Read the following passage and write a summary of no more than 120 words.

6

Thais give a great deal of thought and time to the planning and preparation of their meals. There is an infinite variety of recipes from which they can choose, and rarely would a household repeat the same dish within a fortnight.

The staple food is rice which is the base for most meals. The most commonly-used meats are pork and chicken, with a little beef. Fresh fish and other seafood are plentiful and very popular. Fish can be eaten fresh, salted, dried, fermented and in many other ways. Vegetables too come in profuse variety and are unbelievably cheap. Green leafy vegetables, shoots, roots and young leaves are popular in salads and soups. Even pumpkins and watermelons are used in soups.

Normally, breakfast in a Thai household would probably consist of a lightly boiled egg or rice soup, followed by 'ba ton ko' which are crisp, hollow, fried roots, often dipped in condensed milk. Lunch is likely to feature one of many different sorts of noodles available; and perhaps, dumplings made from flour and sago with a savory filling. The main meal of the day is usually taken early in the evening, with rice as the base for the accompanying dishes such as curried meat, fish, vegetables and noodles. Other savory concoctions generally called 'kap khoa' are prepared with great care and add to the main course. Sweet meats and dishes and fresh fruits, complete the meal. A glass of water is the usual drink taken with the meal.

In Thailand, people virtually eat all day long as it is very convenient to buy snacks. Food vendors station themselves outside offices during the day and outside cinemas at night. Other vendors ride bicycles or motorcycles peddling their wares. When traveling by train, the most outstanding feature of the journey is the rush of food vendors every time the train stops at a station. They offer drinks, sweets and even hot dishes like rice and chicken. However, these vendors are slowly disappearing as commuters are more careful about the food they eat.

Thais do not customarily mix everything into one plate, but take one serving at a time, to be eaten before proceeding to the next. Meals are eaten with a fork and spoon. Noodles are often taken in Chinese fashion with chopsticks.

4. Narrate how you celebrated the last "Pohela Falgun". 6

5. Write an essay of around 250 words on any one of the following: 6

a. Do you agree that the body weight of people of today's world is increasing? Discuss why or why not.

Or,

b. Sports can be the international arrangement that can encourage and improve the relationship of the global community. Argue for or against the statement.

6. Analyze the subject+ verb+ object/complement+ adjunct (if any) of any eight of the following sentences: 8

(Use "/" and underline prominently the clause/ phrase mentioning the element)

a. A barometer measures the pressure of the air.

b. Leave this arena at once!

c. She may do whatever she wishes if she behaves well.

d. Maria has never walked here before.

e. I have just ninety-seven cents.

f. He is a very good cook.

g. One dollar will buy your book of admission tickets.

h. In a rainy forest, twenty-four people sat together to eat.

i. The computer was slow.

j. The magazines on the table are all very interesting.

k. He kept all the books on the shelf.

l. Don't spend beyond your limit.

m. The boy learns his lessons very attentively.

7. Rewrite the following passage, marking corrections in capitalization and punctuation: 5

located at shibli gunj some three kilometres west of historic charminar the 144-year-old islamic university still stands tall equated with al azhar university of cairo for its standard of education jamia nizamia has about 3,000 manuscripts including the over 400-year-old translation of the mahabharata and books written by renowned indian and arabic islamic scholars translated by abu'l-fazal, one of the navratnas (nine jewels) of mughal emperor akbar's royal court the mahabharta runs into 5,012 pages it was in the personal collection of moulana mohammad anwarullah farooqui the founder of jamia the biggest seminary in southern india

8. Use the following words, phrases and clauses in sentences: 5

- a. ...as everything else was unsuccessful
- b. a portable radio
- c. ... for all of us
- d. Magnificent
- e. ...about their intention

**University of Asia Pacific**  
**Department of Basic Sciences & Humanities**  
**Semester Final Examination, Fall-2014**  
**Program: B. Sc. Engineering (Civil)**  
**1<sup>st</sup> year/ 1<sup>st</sup> semester**

Course Title : Calculus I  
Time: 3 Hours

Course Code: Math 101  
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**

- Q1. (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  $[0, 3]$ . 12.5
- Q2. (a) State Cauchy's mean value theorem (MVT). 5  
(b) Verify Cauchy's mean value theorem for  $f(x) = x^3 - 3x^2 + 4$  and  $g(x) = x^2 - x - 2$  on the interval  $[1, 2]$ . 10  
(c) Verify Rolle's MVT for  $f(x) = x^2 - 6x + 8$  on the interval  $[2, 4]$ . 10
- Q3. (a) Let  $f(x) = \frac{1}{3}x^3 - 3x^2 + 8x$ . Find the intervals on which the function  $f(x)$  is (i) 12.5  
increasing, (ii) decreasing, (ii) concave up and (iv) concave down.  
(b) Define relative extrema. Find the relative extrema of  $f(x) = \sin x (1 + \cos x)$ . 12.5
- Q4. (a) State Taylor's theorem with remainder. Use Taylor's theorem to 12.5  
expand  $f(x) = \sin x$  in powers of  $\left(x - \frac{\pi}{2}\right)$  with the remainder term.  
(b) State and prove L' Hospital's rule. Apply this rule to evaluate 12.5  
$$\lim_{x \rightarrow 0} \left( \frac{\ln(\cos x)}{\ln(\cos 3x)} \right)$$

**GROUP-B**

- Q5. Evaluate the following indefinite integrals: 25  
(i)  $\int_0^1 \frac{dx}{5 + 4 \cos x}$  (ii)  $\int \frac{dx}{(e^x + e^{-x})^2}$  (iii)  $\int \frac{\sin^{-1} x}{\sqrt{1-x^2}} dx$   
(iv)  $\int \frac{dx}{2x^2 + x + 1}$  (v)  $\int \frac{dx}{\sqrt{(x-2)(3-x)}}$
- Q6. (a) State the fundamental theorem of calculus. 5  
(b) Evaluate the following definite integrals: 20

$$(i) \int_0^2 \left( \frac{1}{x} - x^2 \right) dx \quad (ii) \int_0^1 (\sqrt{x} - e^{3x}) dx \quad (iii) \int_0^{\frac{\pi}{2}} (\cos 4x) dx \quad (iv) \int_{-4}^2 (x^2 - 3) dx \quad (v)$$

$$\int_0^{\frac{\pi}{2}} \frac{dx}{3 + 2 \cos x}$$

Q7.

(a) Define reduction formula. Find a reduction formula for  $\int \sin^n x dx$ . Hence 15

evaluate  $\int \sin^3 x dx$

(b) Find a reduction formula for  $\int x^3 e^{2x} dx$  10

Q8.

(a) Find the area of the region enclosed by the curves  $y^2 = x$  and  $x^2 = y$  12.5

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



**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Final Examination Fall – 2014**  
**Program: B. Sc Engineering (Civil)**

Course Title: Physics I  
Time: 3.00 Hours

Course Code: PHY-101

Credit: 3.00  
Full Marks: 150

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*[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.]*

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**SECTION A**

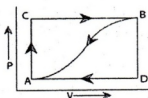
There are **FOUR** questions. Answer any **THREE**

1. (a) Derive the expressions for the apparent pitch when the observer moves towards and away from a stationary source. [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]
2. (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  $\rho$  is density of the gas. [15]
- (b) Discuss the effect of temperature 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]
- $$E = \frac{1}{2} k A^2$$
- where  $E$  is the total energy and  $A$  is the amplitude of the simple harmonic oscillator.
- (b) For a particle vibrating simple harmonically the displacement is 8 cm at the instant the velocity is 6 cm/s and the displacement is 6 cm at the instant the velocity is 8 cm/s. Calculate (i) amplitude (ii) frequency and (iii) time period. [10]
4. (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) epoch, (iv) acceleration at  $t = 5$  s.

## SECTION B

There are FOUR questions. Answer any THREE

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 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  $27^\circ\text{C}$ . If the tyre suddenly bursts, find the resulting temperature. [10]

7. (a) Derive that the difference between the two principle specific heats of a gas can be written as [15]

$$C_p - C_v = R$$

Where  $C_p$  and  $C_v$  are the specific heat at constant pressure and constant volume respectively.

- (b) A quantity of air at  $27^\circ\text{C}$  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'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]

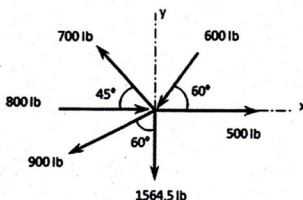
**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Fall 2014**  
**Program: B.Sc Engineering (Civil)**

Course Title: Engineering Mechanics I  
 Time: 3.0 hours

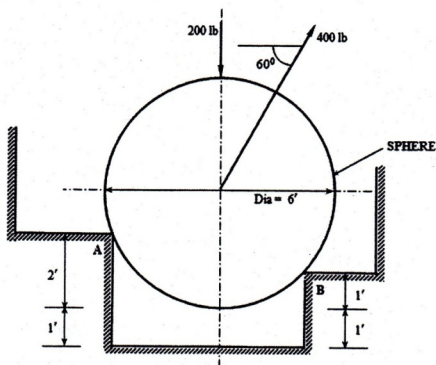
Course Code: CE 101  
 Full Marks: 10 x 10 = 100

*Answer any 10 (Ten) of the following 14 Questions  
 The symbols have their usual meanings.*

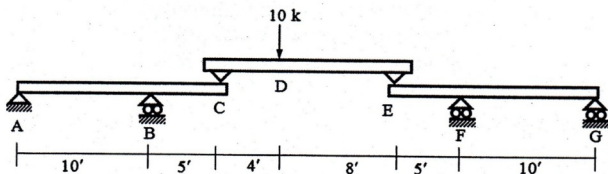
1. Find the resultant of the force system shown below.



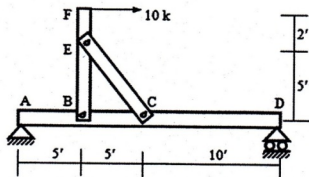
2. In the following figure, find the reactions at A and B. Given that  $W_{\text{SPHERE}} = 500 \text{ lb}$  (assume all surfaces smooth and frictionless).



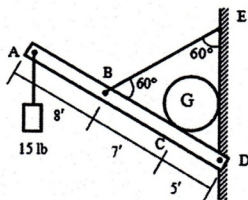
3. In the beam shown below, calculate the reactions at supports A, B, F, G and the bending moment at B.



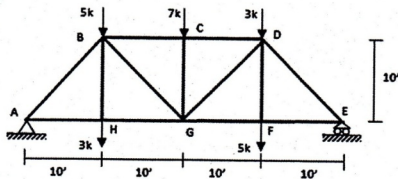
4. In the structure shown below, calculate the force in member EC and the reactions at pin B.



5. In the structure shown below, the weight of sphere G is 10 lb and member ABCD is 20 lb. Calculate the force in EB and the reactions at D. Also draw the free-body diagram of ABCD.

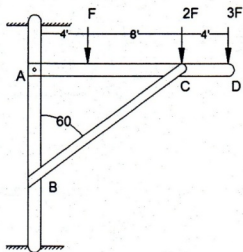


6. Find the forces in members AB, BG, DG and DE of the following truss.



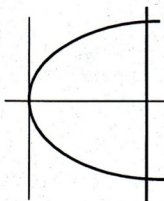
7. A cable weighing 2 lb per ft. is 400 ft long. The distance between the points of support, which are on a horizontal, is 398 ft. Compute the sag and the maximum tension in the cable.

8. On the horizontal boom of the figure, are placed three loads,  $F$ ,  $2F$  and  $3F$ , as shown. What value of  $F$  will produce a thrust of 30,000 lb. on the strut BC. What are the vertical and horizontal components of the resulting pin load at A?

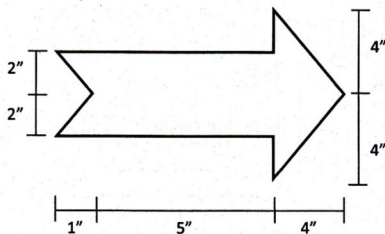


9. What are the theorems of Pappus and Guildinus ? Prove the theorems.

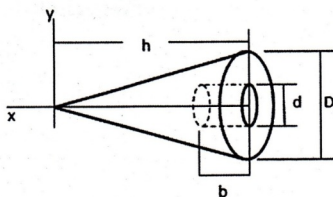
10. An area is bounded by the parabola  $y^2 = 8x$  and the straight line  $x = 5$  in. Determine by integration the centroid of this area.



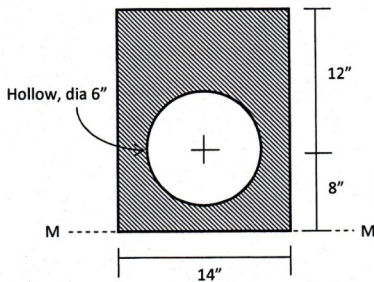
11. Determine the centroid of the following composite area.



12. A right circular cone of homogenous material has a diameter  $D = 20''$ , a height  $h = 30''$ . A cylindrical hole, whose geometric axis is coincident with that of cone, is bored in the base. This hole has a diameter  $d = 8''$  and a depth  $b = 6''$ . Locate the center of gravity of the cone with the hole. Figure is given below.



13. Find the moment of inertia about the axis M-M as shown in the following composite section.



14. For a standard structural steel angle, figure below,  $a = 1 \text{ in}$ ,  $b = 6 \text{ in}$ ,  $c = 8 \text{ in}$ ,  $\bar{x} = 2.65 \text{ in}$ ,  $\bar{y} = 1.65 \text{ in}$ ,

$\bar{I}_x = 38.8 \text{ in}^4$ ,  $\bar{I}_y = 80.8 \text{ in}^4$ . Locate the principal axes and determine the least radius of gyration.

