University of Asia Pacific
Department of Civil Engineering
Final Examination Fall-2016
Program: B.Sc. Engineering (Civil)

Course Title: English Language II
Time: 3.00 Hours

Credit: 3 .00
Full Mark: 50

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1. Read the passage carefully and answer the following questions:

Years ago, a cigarette commercial asked if you were smoking more, but enjoying it less. That describes the way many of us live today. We are doing more, but enjoying it less. And when that doesn't work, we compound the problem. In our frantic search for satisfaction, we try stuffing still more into our days, never realizing that we are taking the wrong approach.

The truth is simple; so simple it is hard to believe. Satisfaction lies with less, not with more. Yet we pursue the myth that this thing, or that activity, will somehow provide the satisfaction we so desperately seek.

Arthur Lindman, in his devastating book, "The Harried Leisure Class," describes the futility of pursuing more. His research focused on what people did with their leisure time. He found that as income rose, people bought more things to occupy their leisure time. But ironically, the more things they bought, the less they valued any one of them. Carried to an extreme, he predicted massive boredom in the midst of tremendous variety. That was more than twenty years ago, and his prediction seems more accurate every year.

Lindman of course, is not the first to discover this. The writer of Ecclesiastes expressed the same thought thousands of years ago. It is better, he wrote, to have less, but enjoy it more. If you would like to enjoy life more, I challenge you to experiment with me. How could you simplify your life? What could you drop? What could you do without? What could you stop pursuing? What few things could you concentrate on? The more I learn the more I realize that fullness of life does not depend on things. The more I give up, the more I seem to gain. But words will never convince you. You must try it for yourself.

A. Choose the correct answer. **3x1=3**

a. Lindman wrote his book
i) ten years ago
ii) twenty years ago
iii) more than twenty years ago

b. We can make our life happier if we

i) get rid of useless things

ii) buy more things

iii) sell things we do not need

c. Arthur Lindman wrote

i) a novel

ii) The Harried Leisure Class

iii) Ecclesistes

B. Answer the following questions using your own words: **1x2=2**

a. When do people normally start buying more things?

b. How can we lead a simple life?

2. Fill in the blanks with appropriate modal verbs. **6x1=6**

i) He _____ not play unless he is compelled.

ii) Take an umbrella because it _____rain later.

iii) It _____be cold outside. That man in the street is wearing a coat.

iv) The museum is free. You _____ pay to get in.

v) I searched for your house for ages. Luckily I _____ find it in the end.

vi) _____ you (pass) me the butter please?

3. Write a review on a movie that you have watched/enjoyed recently. (180 -200words) **7x1=7**

4. Write a story based on the prompt given. (100-150 words) **6x1=6**

It was midnight. Your character was in deep sleep. Suddenly the phone rang……

5. Join the following sentences correctly: **5x1=5**

i) The smiling boy is Shafiq, He is purchasing blue jeans.

ii) There is a school over the lake. I studied there in my childhood.

iii) We were walking to the other side of the island. We found a small stream.

iv) He is the person. I want to see him.

v) Who is that pretty girl? She is sitting in the corner.

6. Write a report on "A Book Fair" (120-150 words) **6x1=6**

7. **Write an essay on any <u>one (1)</u> of the following topics (word limit 200-250) 10x1=10**

i) Unemployment Problem of Bangladesh

Or

ii) Hostel Life vs. Family Life

8. **Describe the following picture.** **5x1=5**

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Chemistry | Course No: CHEM111
Time: 3.0 hours | Full Marks: 150

Section: A

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

1. (a) What is solubility equilibrium? Classify solution depending on the solubility equilibrium. Define each of them. [9]

   (b) Draw the phase diagram of water and a solution illustrating the freezing point depression and boiling point elevation upon addition of a non-volatile solute to water. [8]

   (c) What are the two major factors that determine solubility? Sketch a molecular view of the solution process. [8]

2. (a) State and explain Raoult's law. Define ideal and non-ideal solution. [10]

   (b) Glucose ($C_6H_{12}O_6$) is a sugar that occurs in fruits. It is also known as "blood sugar" because it is found in blood and is the body's main source of energy. What is the molality of a solution containing 1.43 g of glucose dissolved in 50.4 g of water? What are the boiling point and the freezing point of this solution? Boiling-point-elevation constant (K_b) and freezing-point-depression constant (K_f) of water are 0.512 and 1.858°C/m respectively. [15]

3. (a) What are colloids? How do you distinguish solution and colloid using Tyndall effect? [9]

   (b) Define hydrophobic and hydrophilic colloids. Give examples. [8]

   (c) Explain the coagulation of colloids. Consider the following cases: (i) $Fe(OH)_3$ is surrounded by Cl^- ions, and (ii) $Fe(OH)_3$ is surrounded by PO_4^{3-} ions. Explain when coagulation is more likely to occur. [8]

4. (a) Define phase, component and degrees of freedom. State phase rule. [9]

   (b) Draw the phase diagram of water and label all the regions and equilibrium. Determine the degrees of freedom at all places of the phase diagram. [8]

   (c) What is meant by self-ionization of water? Calculate the concentration of H_3O^+ in blood. Given that the pH of blood is 7.4. [8]

Section: B

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

5. (a) Define rate, rate law and order of reaction. What are the parameters that influence the rate of a reaction? [10]

(b) Iodide ion is oxidized in acidic solution to triiodide ion, I_3^-, by hydrogen peroxide.

$$H_2O_{2(aq)} + 3I^-_{(aq)} + 3H^+_{(aq)} \rightarrow I_3^-{}_{(aq)} + 2H_2O_{(l)}$$

A series of four experiments was run at different concentrations, and the initial rates of I_3^- formation were determined as follows. Obtain the reaction orders with respect to each of the reactants, find the rate law and then find the rate constant. [15]

Exp. No.	*Initial concentrations (mol/L)*			*Initial rate*
	H_2O_2	I^-	H^+	*[mol/(L.s)]*
Exp. 1	0.01	0.01	0.0005	1×10^{-6}
Exp. 2	0.02	0.01	0.0005	2×10^{-6}
Exp. 3	0.01	0.02	0.0005	2×10^{-6}
Exp. 4	0.01	0.01	0.0010	1×10^{-6}

6. (a) Define chemical equilibrium. What is the relationship between the equilibrium constants K_p and K_c? What will be K_p for the methanation reaction if $K_c = 3.92$ at 25 ^{0}C? The reaction is:

$$CO(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$$ [10]

(b) Carbon monoxide and hydrogen react according to the following equation:

$$CO(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$$

When 1.000 mol CO and 3.000 mol H_2 are placed in a 10.00-L vessel at 927°C (1200 K) and allowed to come to equilibrium, the mixture is found to contain 0.387 mol H_2O. What is the molar composition of the equilibrium mixture? That is, how many moles of each substance are present? What is the value of K_c for the reaction at this temperature? [15]

7. (a) Define reaction quotient, Q_c. Predict the direction of the following methanation reaction

$$CO(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$$

if (i) $Q_c > K_c$, (ii) $Q_c = K_c$, (iii) $Q_c < K_c$. [9]

(b) A 50.0-L reaction vessel contains 1.00 mol N_2, 3.00 mol H_2, and 0.500 mol NH_3. Will more ammonia, NH_3, be formed or will it dissociate when the mixture goes to equilibrium at 400 °C? The equation is:

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$ [8]

Given that the K_c is 0.500 at 400°C.

(c) State *Le Chatelier's* principle. Predict the effect of temperature and pressure on the following reaction for the conversion of ethylene (C_2H_4) to ethane (C_2H_6).

$$C_2H_4(g) + H_2(g) \rightleftharpoons C_2H_6(g);\ \Delta H^\circ < 0$$ [8]

8. (a) Describe a coffee-cup calorimeter. What is meant by specific heat? How is it used to calculate the heat of reaction? [9]

(b) Manganese metal can be obtained by reaction of manganese dioxide with aluminum.

$$4Al(s) + 3MnO_2(s) \longrightarrow 2Al_2O_3(s) + 3Mn(s)$$ [8]

What is ΔH for this reaction? Use the following data:

$$2Al(s) + \tfrac{3}{2}O_2(g) \longrightarrow Al_2O_3(s);\ \Delta H = -1676 \text{ kJ}$$

$$Mn(s) + O_2(g) \longrightarrow MnO_2(s);\ \Delta H = -520 \text{ kJ}$$

(c) Define standard heat of formation. Explain why it is important in thermochemistry. [8]

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination Fall 2016
Program: B.Sc in Civil Engineering

Course Title: Mathematics II
Time: 3 hours

Course Code: MTH 103
Full Marks: 150

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

1. (a) Find the equation of the plane which passes through the intersection of planes $7x - 4y + 7z + 16 = 0$ and $4x + 3y - 2z + 3 = 0$ and is parallel to the plane $3x - 7y + 9z + 5 = 0$. **12**

(b) Find the distance between the point $(-1, -5, -10)$ and the point of intersection of the straight line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane $x - y + z = 5$. **13**

2. (a) Show that the equation $3x^2 + 4y^2 + z^2 - 12x - 16y + 4z - 4 = 0$ represents an ellipsoid. Also find its centre and lengths of the semi-axes. **10**

(b) Transform the equation $7x^2 + 18xy - 7y^2 - 16x - 32y - 18 = 0$ to one in which there is no x, y and xy terms. **15**

3. (a) Show that the plane $2x - 2y + z + 16 = 0$ touches the sphere $x^2 + y^2 + z^2 + 2x - 4y + 2z - 3 = 0$. **12**

(b) Find the equation of the plane through the points $(2,3,1), (1,1,3)$ and $(2,2,3)$. Find also the perpendicular distance from the points $(5,6,7)$ to the plane. **10+3**

4. (a) Define dot and cross product of a vector. Find the Sine of the angle between the vectors $2\hat{\imath} + \hat{\jmath} + \hat{k}$ *and* $\hat{\imath} - \hat{\jmath} + 2\hat{k}$. Also find the unit vector perpendicular to each of the vectors. **2+4+4**

(b) Prove that, $curlcurl\vec{f} = -\nabla^2\vec{f} + \vec{\nabla}.(\vec{\nabla}\vec{f})$. **10**

(c) Find the area of the triangle whose vertices are $A(1,3,2), B(2,-1,1), C(-1,2,3)$. **5**

5. (a) Define directional derivative. Find the directional derivative of $\varphi = x^2yz + 4xz^2$ at $(1,-2,-1)$ in the direction of the vector $\vec{a} = 2\hat{\imath} - \hat{\jmath} - 2\hat{k}$. **2+8**

(b) Find the volume of the parallelepiped whose edges are represented by $5\hat{\imath} + 7\hat{\jmath} + \hat{k}$, $\hat{\imath} - 3\hat{\jmath} - \hat{k}$ and $\hat{\imath} - 2\hat{\jmath} - 9\hat{k}$ **10**

(c) Find the unit normal to the surface $x^2y + 2xz = 4$ at the point $(2, -2, 3)$. **5**

6. (a) Given $\varphi = 2x^3y^2z^4$, Find Div(Grad φ) and also show that $\vec{\nabla}.\vec{\nabla}\varphi = \nabla^2\varphi$ **10**

(b) If $\varphi(x, y, z) = xy^2z$ and $\vec{A} = xz\hat{\imath} - xy^2\hat{\jmath} + yz^2\hat{k}$, find $\frac{\partial^3}{\partial x^2 \partial z}(\varphi\vec{A})$ at the point $(2, -1, 1)$. **8**

(c) Show that $\vec{\nabla}r^n = nr^{n-2}\vec{r}$ **7**

7. (a) State Green's theorem. Verify Green's theorem in the plane for $\oint_C \{(3x^2 - 8y^2)dx + (4y - 6xy)dy\}$, where C is the closed curve of the region bounded by $y^2 = x$ and $y = x^2$. **3+12**

(b) The acceleration of a particle at any time $t \geq 0$ is given by **10**

$\vec{a} = 12Cos(2t)\hat{\imath} - 8Sin(2t)\hat{\jmath} + 16t\hat{k}$. If the velocity and displacement are zero at $t = 0$ then find velocity and displacement at any time t.

8. (a) Evaluate $\iint_S \vec{A} \cdot \hat{n}\, ds$, where $\vec{A} = z\hat{\imath} + x\hat{\jmath} - 3y^2z\hat{k}$ and S is the surface of the cylinder $x^2 + y^2 = 16$ included in the first octant between $z = 0$ and $z = 5$. **13**

(b) Define Line integral. If $\phi = 2xyz^2$, $\vec{F} = xy\hat{\imath} - z\hat{\jmath} + x^2\hat{k}$ and C is the curve $x = t^2, y = 2t, z = t^3$ from $t = 0$ to $t = 1$, evaluate the line integrals **2+5+5**

(i) $\int_C \phi\, \vec{dr}$

(ii) $\int_C \vec{F} \times \vec{dr}$

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016 (Set A)
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Mechanics II
Time: 3.0 hours

Course Code :CE 103
FullMarks:100(=10×10)

[Answer any 10 (Ten) of the following 14 (Fourteen) questions]

1. The uniform beam ABC in Figure 1 weighs 40 lb. The coefficient of friction between the cord and the fixed drum is 0.3. Determine the smallest value of weight W for which the beam will remain horizontal.

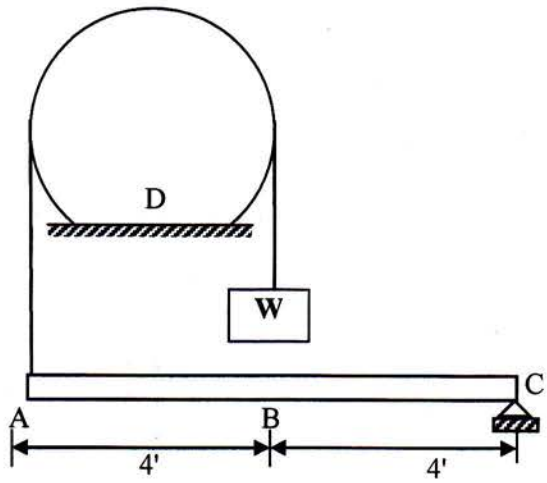


Figure: 1

2. For the following Figure 2, what is the weight of B, if the block A impends downward? Will the block A slide or tip over?

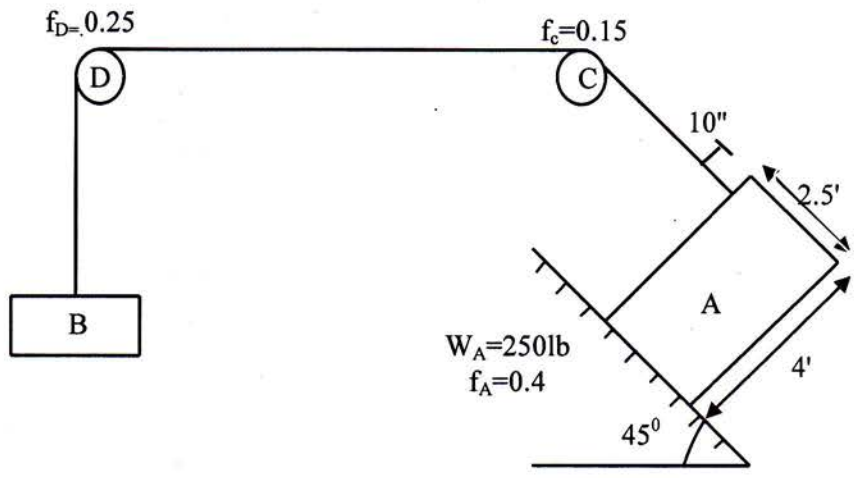


Figure: 2

3. Calculate the moment of inertia about the geometric axis A-B of the cast iron frustum of a cone shown in Figure 3, which has a short 4 x 2-ft cylindrical hole near the base. Unit weight of cast iron is 490 lb/ft^3.

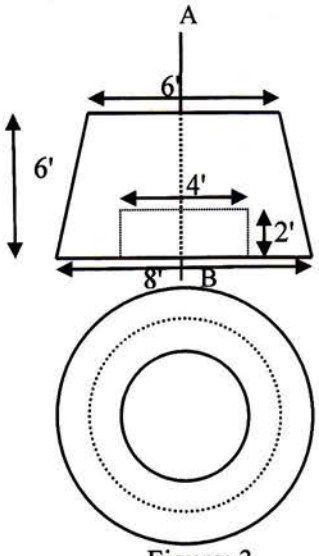


Figure: 3

4. The sliding member A and B in Figure 4 are constrained to move at all times in the y and x directions, respectively. They are connected by the rod whose length is L=10 ft. At the instant when x=8 ft, v_B=20 fps toward the right and a_B= - 15fps^2 toward the left. Determine the velocity and acceleration of A at this instant.

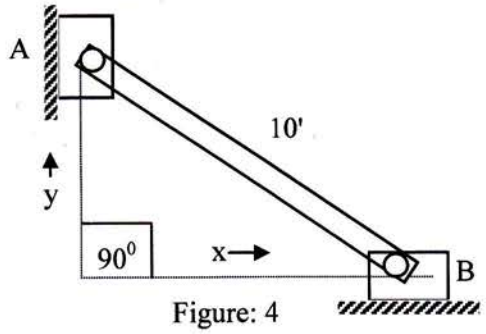


Figure: 4

5. Determine the smallest horizontal force P in Figure 5 required to lift the 200 lb crate. Coefficient of friction at all contacting surface is 0.20.Neglect the weight of the wedge.

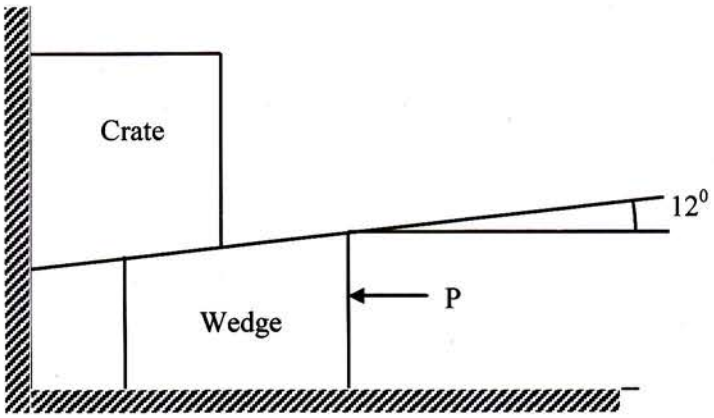


Figure: 5

6. In ***Fig.6***, the bodies A and B weigh W_A= 50 lb, W_B= 20 lb, with pulley diameters d_A= 1 ft and d_B= 2 ft. Rotating part C weighs 75 lb and has a radius of gyration 1.25 ft with respect to its axis. Coefficient of kinetic friction for A and B is 0.25 and 0.30 respectively. If B moves 4 ft from rest, calculate velocity of A and B using work energy principle.

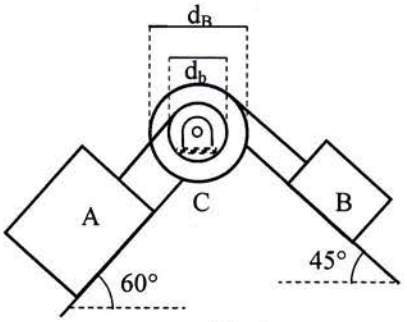


Fig.6

Fig.7

7. A 15 lb block in ***Fig.7***, rests upon a rough horizontal surface where coefficient of friction= 0.30. It is in contact with a spring which has been compressed 8 in when Q= 10 lb is applied. As the left end of the spring is attached to a fixed wall, when Q= 0 lb, the spring reaches its free length and acts upon the block. Calculate constant of the spring, if half of its kinetic energy is used up against friction to move the block 10 ft rightward.

8. A system weighing 6 lb is spinning counterlockwise with respect to point C shown in ***Fig.8*** Here, AC= BC= DC= 3ft. When force E is applied, the system accelerates. Angular velocity after the force is removed is 1.3 times of initial angular velocity. a) How much work is done by E= 10 lb through a rotation of 55°? The effects of friction are negligible. b) What is the final angular velocity if radius of gyration of the spinning part is 2.5 ft?

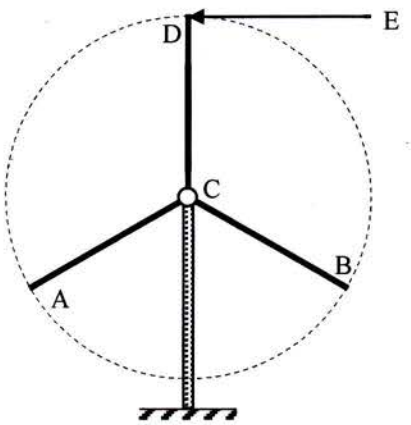


Fig.8

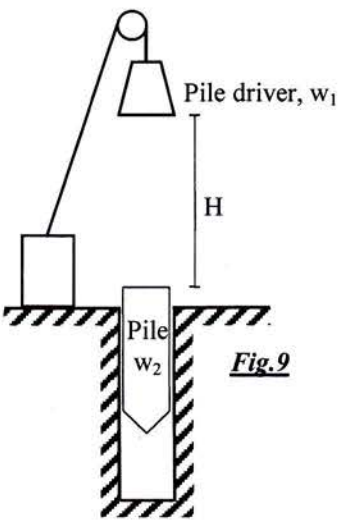


Fig.9

9. A pile-driver of weight, w_1 = 35.5 kip drives a pile of weight, w_2= 7 kip vertically into the ground. The driver falls freely a vertical distance of H = 7 ft before hitting the pile and there is no rebound. Calculate the velocity of driver and pile after impact.

10. For the same system in ***Oues 9*** if w_2= 6 kip and H = 5.5 ft, combined velocity of driver and pile is calculated 16 fps. Calculate acceleration of pile after impact. When will the pile stop into the ground? Given that ground resistance is 250 kip.

11. A 0.35 lb bullet is fired from a 3.5 lb gun with a velocity of 7000 fps. Calculate kinetic energy of the gun from the impact of the bullet leaving the gun.
    Also calculate coefficient of restitution for the impact.

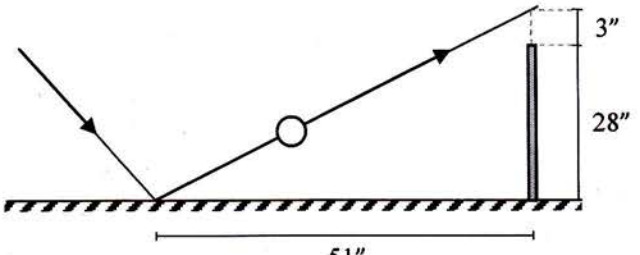


Fig.10

12. A cricket ball is thrown in such a manner that it hits the pitch at point D, shown in ***Fig.10***, and bounces towards the stump and passes it 3 in above stump height. Coefficient of restitution is 0.45 between pitch and ball. Assuming that the path of ball is linear and pitch surface smooth, calculate the velocity of the ball just before and after impact.

13. Calculate the magnitude of the resultant, its point of action and direction cosines for the following system of non-coplanar forces: L (300 lb, 4, -2, 7, 1, 2, 3);
M (400 lb, -1, 6, -2, 1, 2, 3);
N (200 lb, -3, 7, 0, 1, 2, 3).

14. A chair, shown in ***Fig. 11(a),*** has three legs, placed at the corner of an equilateral triangle as shown in ***Fig. 11(b).*** Back of the chair weighing 2 lb, is attached on O and P. Q is an object weighing 4 lb, placed at (9", 6"). Calculate reactions at the legs neglecting self-weight of seat.

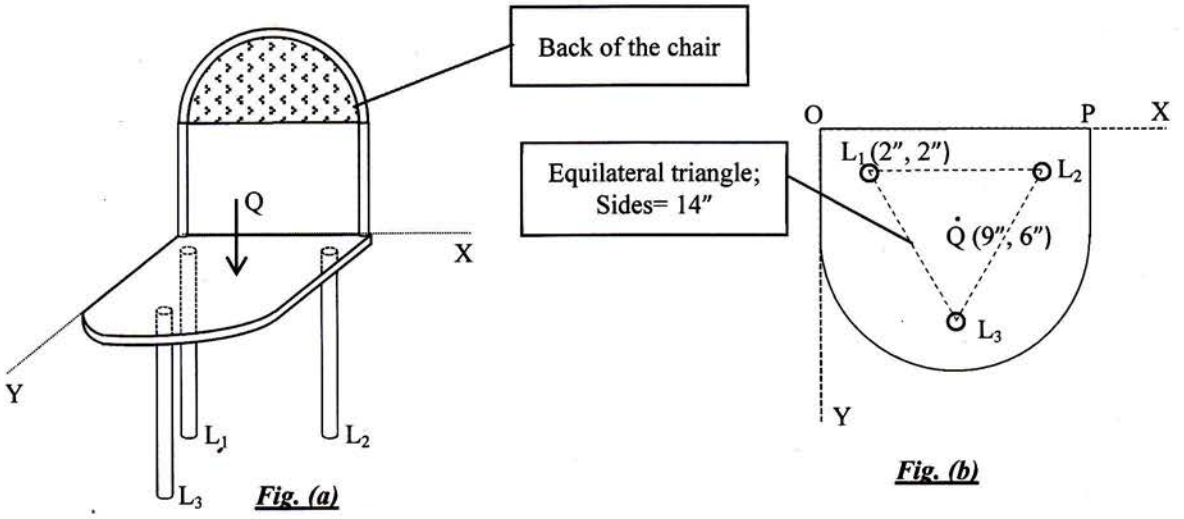


Fig. (a) ***Fig. (b)***

Fig.11

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016 (Set B)
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Mechanics II
Time: 3.0 hours

Course Code :CE 103
FullMarks:100(=10×10)

[Answer any 10 (Ten) of the following 14 (Fourteen) questions]

1. Calculate required force Q in ***Fig. 1*** to move block A leftward by moving the wedge downward, if A weighs 100 kN. Neglect weight of the wedge. Coefficient of static friction: for both sides of wedge = 0.25; between block and horizontal surface = 0.45

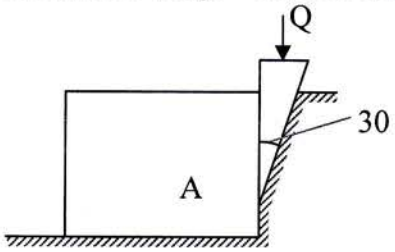


Fig.1

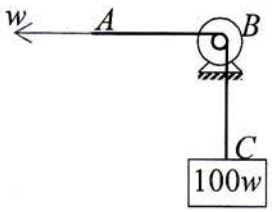


Fig.2

2. In the system shown in ***Fig. 2***, weightless cable *ABC* is wrapped around pulley *B*. Horizontal pull *w* can hold block C of 100*w* weight, if cable is wrapped around the pulley *n* times. Calculate the minimum number of turns (*n*) required. Co-efficient of static friction between pulley and cable is 0.15.

3. a) Derive the expression for the moment of inertia of a homogenous hemisphere about a diameter.

   b) Calculate moment of inertia of a hemisphere of radius 12 cm and unit weight 100 N/m^3 about the same axis.

4. A car, shown in ***Fig. 3*** weighing 4.5 kip starts to move downward from rest by its own weight. Brake is applied after the car moves for 5 seconds. The car starts to decelerate in such a manner that it stops at 500 ft away from the point it started to move. Assume the inclined surface is smooth; calculate acceleration after brake was applied. Angle of inclination = 30°.

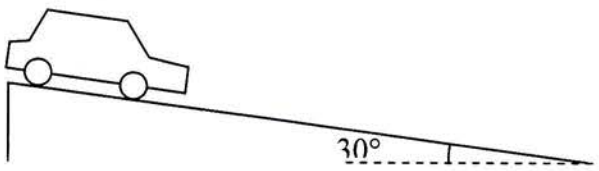


Fig.3

5. a) A body starting from rest rotates counter clockwise according to $\alpha = 2t + 3$. Calculate its angular velocity and angular displacement after 5 seconds.

   b) Second hand of an analog clock starts to malfunction at 10:00 am, so that at 11:30 am, the clock displayed 11:23 am. Calculate angular velocity of minute hand and hour hand during this period.

6. At point A in the Figure 4 shown below, a spring (spring constant. k=1000 N/m) is compressed 50.0 cm by a 2.0 kg block that travels over the frictionless track until it is launched into the air at point B. The inclined part of the track makes an angle 55^0 with the horizontal and point B is a height 4.5 m above the ground. What is the velocity of the block at point A?

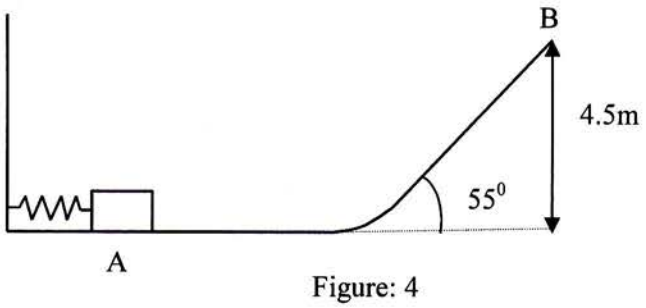


Figure: 4

7. A block of mass 5 kg on a flat table is connected by a string of negligible mass to a vertical spring (spring constant 100 N/m) which is fixed to the floor. The string goes over a pulley that is solid disk of mass 1 kg and radius 0.5 m. As shown in the diagram below, the spring is initially in its equilibrium position and the system is not moving. A person pulls the blocks with force 200 N through a distance 1.5 m .Determine the speed v of the block after it has moved distance 1.5 m along the frictionless table top.

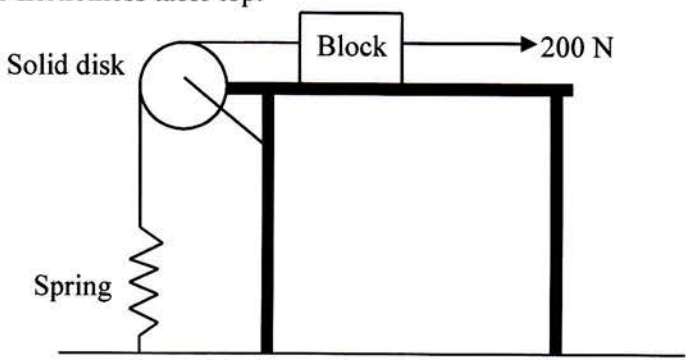


Figure: 5

8. In the Figure 6 below, a block of mass 5.0 kg start at point A with a speed of 15.0 m/s on a flat frictionless surface. At point B, it encounters 2.2 m long and 14^0 incline with coefficient of kinetic friction 0.15. The block makes it up the incline to a second flat frictionless surface. What is the work done by friction? What is the velocity of the block at point C?

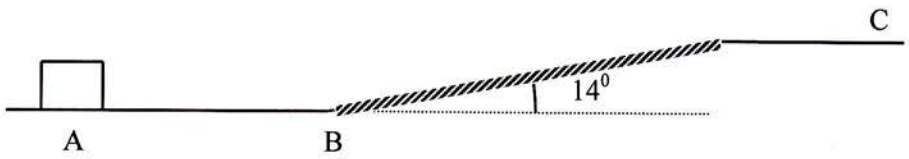


Figure: 6

9. Suppose, you are stuck in a boat in the middle of a lake. Luckily, you brought your mechanics book. You decide to use your book to propel you back to the shore. You throw your 1 kg book overboard with a speed of 10 m/s to propel yourself back towards the shore. Assume the combined mass of you and the boat is 100 kg.
(i) Unfortunately, it starts raining. 10 kg of rainwater has accumulated in the bottom of your boat. What is your speed now?
(ii)How long would it take you to reach the shore which is 60m away after throwing your book? (Ignore friction between the water and the boat.).

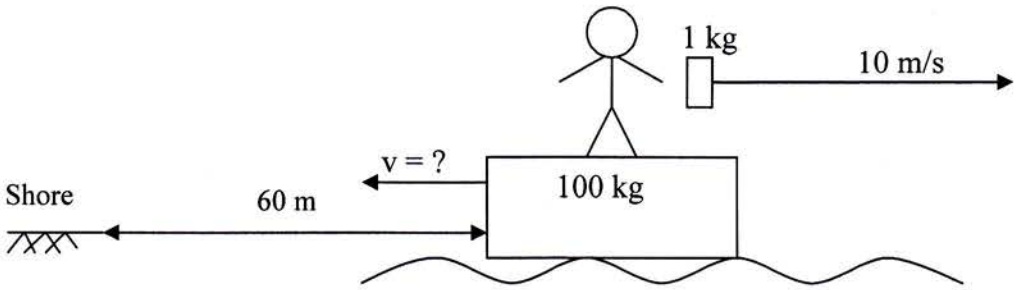


Figure: 7

10. A 10 lb block is suspended by a long cord. The block is at rest when a 0.05 lb bullet travelling horizontally to the Ieft strikes the block and is embedded in it. The impact causes the block to swing upward 0.50 ft measured vertically from its lowest position.
Determine:
(i)velocity of bullet just before it strikes the block and
(ii) loss of kinetic energy of system during the impact.

11. A 100 N block is released from rest on an inclined plane (Figure 8) which is making an angle 30^0 to the horizontal. The block starts from A, slides down a distance of 1.5 m and strikes a spring with stiffness of 10 KN/m. The coefficient of friction between the inclined plane and the block is 0.20.
Determine:
(i) Maximum deformation of the spring in bringing block to the rest.
(ii) Distance the block will rebound up the plane from the compressed position.

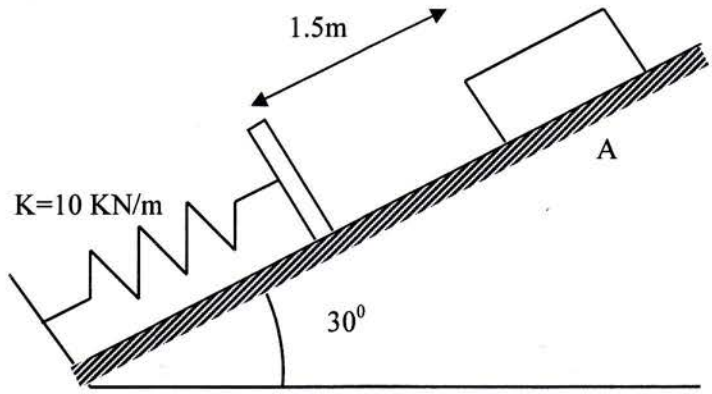


Figure: 8

12. Six parallel force act on a concrete slab as shown in the Figure 9. Determine the magnitude and location of the resultant of the forces.

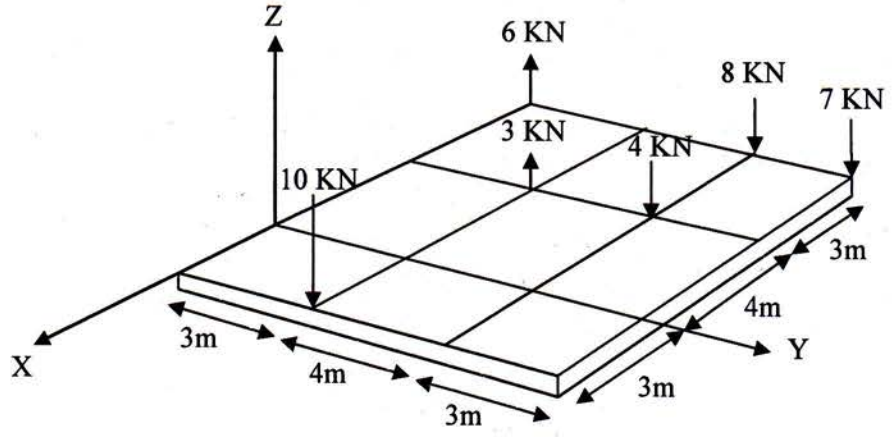


Figure: 9

13. A 200 kg weight is supported by cables OA, OB and OC as shown in Figure 10. Determine the tension in each cable.

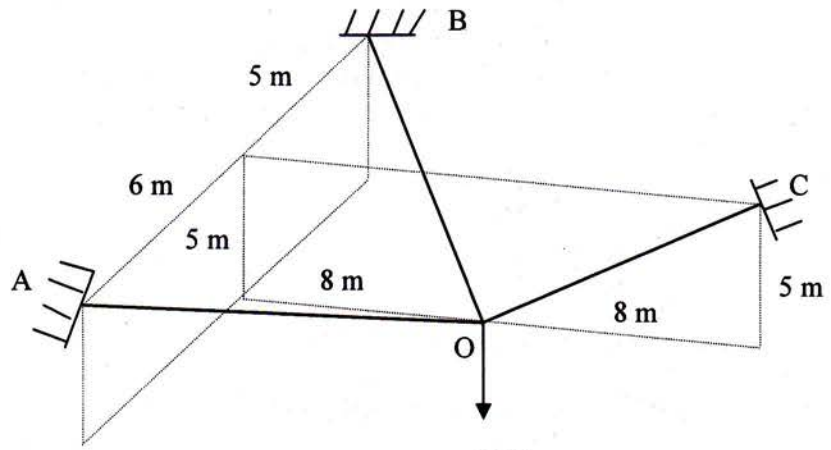


Figure: 10

14. A cyclist and his bicycle have a mass of 80 kg. After 100m he reaches the top of a hill, with slope 3 in 4 at a speed of 2 m/s. He then free wheels the 100 m to the bottom of the hill where his speed has increased to 9 m/s. How much energy has he lost on the hill?

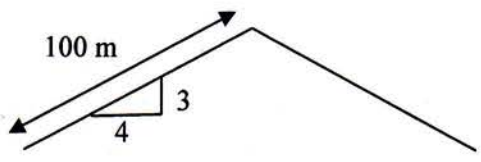


Figure: 11

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program : B.Sc Engineering (Civil)

Course Title : Surveying | Course Code: **CE105 (A)**
Time : 3 hours | Full Marks : 100

Section- A: Answer any 2 (Two) out of 3 (Three)

1. (a) Define Transition curves & state its function. [03]
   (b) Write short notes on Super-elevation & Centrifugal ratio [03]
   (c) A proposed highway is deflected at chainage 1500 m by 25°. Design speed of vehicle is 90 km/hr. Design the alignment of highway so that only transition curve is used. At the end of the transition curve, radius of curvature is 600 m. Calculate the apex distance, chainage of point of curve and the chainage of point of tangent. Given the road width is 14 m, maximum rate of super-elevation is 0.06 and maximum side friction co-efficient is 0.12. [16]
   (d) The tangent length and the chord length of a curve are respectively 748 ft and 413 ft. Find the Degree of Curvature of the curve. [03]

2. (a) Discuss briefly the different linear methods of setting out curves. [6]
   (b) Derive the relation between radius of curvature (R) and degree of curvature (D) from both the definitions. [4]
   (c) The scale of an aerial photograph is 1 cm=100 m, and the size of the photograph is 24 cm x 24 cm. If the longitudinal lap is 65% and side lap is 35%, determine the number of photographs to cover an area of 150 km^2. [4]
   (d) The following observations were taken in a tacheometric survey. The multiplying constant is 100 and the additive constant is 1 ft. The staff was held normal to the line of sight. [8]

Instrument Station	Staff Station	Whole Circle Bearing	Vertical Angle (Θ)	Stadia Reading (ft)
X	A	24°15′	1°30′	3.4,3.8,4.2
	B	35°30′	-2°	2.5,3.65,4.8
	C	125°30′	5°	2.8,5.3,7.8

   RL of A=20 ft. Determine the R.L of B and C. Also determine the horizontal distance of BC.
   (e) What is the purpose of GIS? Describe some uses of remote sensing. [3]

3. (a) Write short note on remote sensing. What are the principles of remote sensing? [3+2]
   (b) A closed traverse was conducted round an obstacle and the following measurements are made. Find out the missing lengths. (i.e. DE and EA) [10]

Side	Length (m)	Bearing
AB	217.5	120°15′
BC	318	62°30′
CD	375	322°24′
DE	?	335°18′
EA	?	S11°42′W

(c) Define the following: [2+2]
i) Crab and Drift
ii) Longitudinal and lateral overlap

(d) Derive the following equation for distance for a tacheometer, D=ks+c [2]

(e) Describe the principle of terrestrial photogrammetry. List the factor to be considered in selecting camera station. [4]

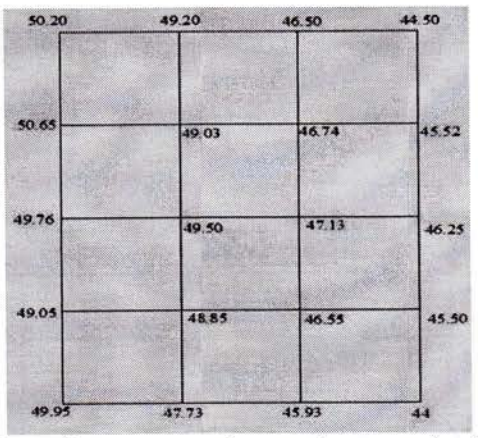
Section- B

4. **Answer any Five (5X4 =20)** [4*5]

a) Discuss in brief principles of surveying.
b) With examples explain cumulative errors and compensating errors.
c) On a sloping or uneven ground how will you do chaining? Explain one method with figure.
d) What is contour? Write the characteristics of contour.
e) Explain intersection method of plane table surveying with sketches.
f) Define: a) True Meridian, b) Arbitrary Meridian

5. **Answer any one (1X12=12)** [12]

a) Draw contour lines for 50 m, 49 m, 48 m, 47 m, 46 m and 45 m for the following grid.



b) The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eight readings: ***2.228; 1.606; 0.988; 2.090; 2.864; 1.262; 0.602; 1.982; 1.044; 2.684*** metres.
Enter the above readings in a page of a level book and calculate the R.L. of points if the first reading was taken with a staff held on a bench mark of 432.384 m.

6. **Answer any three (3X6 =18)** [3*6]

a) A series of offsets were taken from a chain line to a curved boundary line at intervals of 15 metres in the following order.
0, 2.65, 3.80, 3.75, 4.65, 3.60, 4.95, 5.85.
Compute the area between the chain line, the curved boundary and the end offsets by a) trapezoidal rule, and b) by average ordinate rule.

b) Determine the values of included angles in the closed compass traverse ABCD conducted in the clockwise direction, given the following fore bearings of their respective lines:

Line	*F.B.*
AB	*40°*
BC	*70°*
CD	*210°*
DA	*280°*

Apply the check.

c) A survey line ABC cuts the banks of a river at B and C, and to determine the distance BC, a line BE, 60 m long was set out roughly parallel to the river. A point D was then found in CE produced and middle point F of DB determined. EF was then produced to G, Making FG equal to EF, and DG produced to cut the survey line in H. GH and HB were found to be 40 and 80 metres long respectively. Find the distance from B to C.

d) A chain was tested before starting the survey, and was found to be exactly 20 metres. At the end of the survey, it was tested again and was found to be 20.12 metres. Area of the plan of the field drawn to a scale of 1 cm= 6 m was 504 sq. cm. Find the true area of the field in sq. metres.

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program :B.Sc Engineering (Civil)

Course Title : Surveying — Course Code: **CE105 (B)**
Time : 3hours — Full Marks : 100

Section- A: Answer any 2 (Two) out of 3 (Three)

1. (a) What are the characteristics of contour map? Draw typical contour diagrams for the following cases: [07]
   i) A pond ii) Hill
   (b) Write down the advantages and disadvantages of Chain Surveying? [04]
   (c) A closed traverse was conducted round an obstacle and the following measurements are made. Find out the missing lengths. (i.e. DE and EA) [14]

Side	Length (m)	Bearing
AB	217.5	120°15′
BC	318	62°30′
CD	375	322°24′
DE	?	335°18′
EA	?	S11°42′W

2. (a) Compare between the following : [6]
   i) True Meridian and Magnetic Meridian
   ii) Chain Surveying and Traversing
   (b) What are the instruments required in chain surveying? What are the different considerations of marking and fixing survey stations? [2+4]
   (c) Write short note on reconnaissance. [4]
   (d) Calculate the volume of earth work in a road embankment with the following data : [9]

Chainage along Center Line	0	100	200	300	400	500
Ground level	70	71	80	77	77	73

Formation level at chainage 0 is 63 ft, top width is 32 ft , side slopes are 4 to 1. The longitudinal gradient if the embankment is 1 in 100 rising. The ground is assumed to be level all across the longitudinal section.

3. (a) Define Magnetic Declination. What are the different types of variations in declination? [3+5]
   (b) Define the following: [2+2]
   i) Latitude & Departure
   ii)Bench mark & Datum
   (c) What are the purposes of 'Check line' & 'Tie line' in chain surveying? [2]
   (d) A series of offsets were taken from a chain line to a curved boundary line in the following order. [11]

Chainage	0	25	50	75	100	175	250	300	350
Offset	10.12	9.62	7.32	14.09	16.98	15.80	10.12	6.04	12.33

Compute the area between the chain line, the curved boundary and the end offsets by :
(i) Trapezoidal rule (ii) Simpson's Rule

Section- B

4. **Answer any Five** [4*5]

a) Write 4 applications of remote sensing with examples.
b) How GIS and Remote Sensing can be linked?
c) Explain the principles of Photogrammetry.
d) Define: i) Zenith and Nadir, ii) Sensible Horizon and Visible horizon
e) Why do we provide transition curve?
f) With a sketch explain Point of Intersection, Deflection Angle, Point of Curvature, and Point of Tangency.

5. **Answer any one** [12]

a) The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eight readings: ***2.228; 1.606; 0.988; 2.090; 2.864; 1.262; 0.602; 1.982; 1.044; 2.684*** metres.
Enter the above readings in a page of a level book and calculate the R.L. of points if the first reading was taken with a staff held on a bench mark of 432.384 m.
b) The tangents intersect at chainage ***59+60***, the deflection angle being $50^{o}30^{'}$. Calculate the necessary data for setting out a curve of ***15*** chains radius to connect the two tangents if it is intended to set out the curve by offset from chords. Take peg interval equal to 100 links, length of the chain being equal to ***20*** metres (***100*** links).

6. **Answer any three** [3*6]

a) A section line AB appears to be 10.16 cm on a photograph for which the focal length is 16 cm. The corresponding line measures 2.54 cm on a map which is to scale 1/50,000. The terrain has an average elevation of 200 m above mean sea level. Calculate the flying altitude of the aircraft, above mean sea level, when the photograph was taken.
b) Calculate the ordinates at 5 metres distances for a circular curve having a long chord of 40 metres and a versed sine of 2 metres.
c) A transition curve is required for a circular curve of 400 m radius, the gauge being 1.5 m between rail centre and maximum super elevation restricted to 12 cm. the transition is to be designed for a velocity such that no lateral pressure is imposed on rails and the rate of gain of the radial acceleration is $30 cm/sec^3$. Calculate the required length of transition curve and design speed.
d) Determine the offset to be set out at 1 chain interval along the tangents to locate a 20 chain curve, the length of each chain being 20 m.