1-2

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

Course Title: Surveying | Course Code: CE 105

Time: 3 hour | Full Marks: 100

Part A

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

1. (a) Express the functions and criteria of transition curves. [04]

   (b) Draw a neat sketch of circular curve showing all the elements. Derive the expression of spiral angle (Δ_S) [08]

   (c) A combined curve of 5° curvature is to be placed. The deflection angle of the intersection angle at the Chainage of intersection is 3000 meter and permissible vehicle speed is 50 mph. [13]

   Calculate :

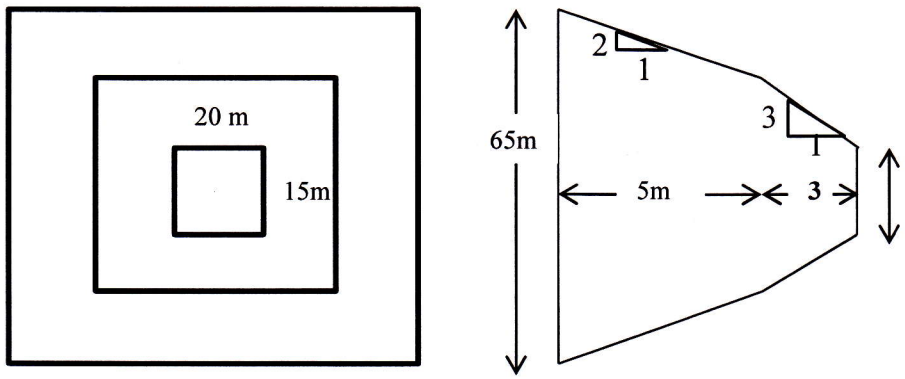
   i) Length of circular curve and transition curve

   ii) Chainage at the point of tangency

   iii) Apex distance

2. (a) Compare between 'closed' and 'open' traverse. Suppose you are asked to conduct traverse surveying for a road, which type of traverse will you prefer and why? [04]

   (b) Applying trapezoidal rule, compute the capacity of a 8 m deep reservoir [15]



   (c) The following lengths and bearings were recorded in running a traverse ABCDE , the length and bearing of EA having been omitted. Find the Length and Bearing of EA. [06]

Side	Length (m)	Bearing
AB	217.5	120°15′
BC	318	62°30′
CD	375	322°24′
DE	283.5	N24°42′W
EA	?	?

3 (a) What are the characteristics of contour lines? [05]

(b) Explain how you will continue chaining past the following obstacle : [05]

a building

(c) The following observations were taken in a tacheometric survey. The multiplying constant is 100 and additive constant is 1. The staff was held normal to the inclined line of sight. Find the distance between A and B if A , X , B are in the same line with instrument station in the middle. [15]

Instrument station	Staff station	Vertical Angle	Stadia Reading (ft)
X	A	-2°	2.5, 3.65, 44.8
	B	5°	2.8, 5.3, 7.8

Part B

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

1. (a) Define the following terms: [12]
Datum, Elevation, Back sight , Foresight

(b) The following readings have been taken from the page of an old level book. Reconstruct the page, fill up the missing quantities and apply usual checks. [13]

Point	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
1	3.125					X	B.M.
2	x		X	1.325		125.005	T.P.
3		2.3210					
4		X			.055	125.350	
5	X		2.655				T.P.
6	1.620		3.205		2.165		T.P.
7		3.625					
8			X			122.590	T.B.M.

2. (a) A vertical photograph was taken at an altitude of 1200 metres above mean sea level. Determine the scale of the photograph for terrain lying at elevation of 80 metres and 300 metres if the focal length of camera is 15 cm. [13]

(b) The scale of an aerial photograph is 1 cm= 100m. The photograph size is 20 cmX20 cm. Determine the number of photographs required to cover an area of 100 sq. km if the longitudinal lap is 60% and the side lap is 30%. [07]

(c) You have to model environmental changes using GIS, express the necessary components you need to do that? [05]

3. (a) Explain remote sensing process. [08]

(b) How can you link GIS and Remote Sensing? [10]

(c) Explain Celestial Sphere and Sensible Horizon. [07]

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

Course Title: Engineering Mechanics II
Time: 3.0 hours

Course Code: CE 103
Full Marks:100(=10×10)

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

1. The 2225-N block shown in ***Figure 1*** below is resting on 45° inclined rough surface. The coefficient of static friction is 0.25. Compute the value of the horizontal force P necessary to
(a) just start the block up the incline (b) just prevent motion down the incline.

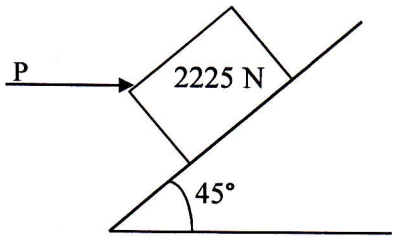


Figure 1

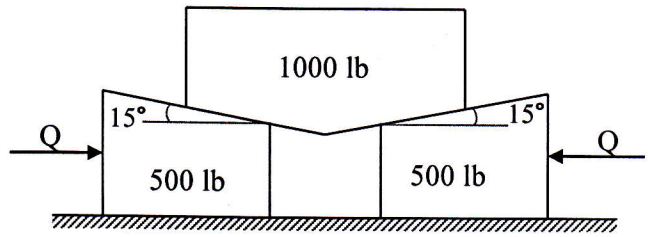


Figure 2

2. What force Q must be applied simultaneously to the wedges shown in ***Figure 2*** to prevent them from moving under the block? The coeffecient of friction for all contact surfaces is 0.17.

3. Calculate the mass moment of inertia of the composite body with respect to centroidal Y axis shown in ***Figure 3***.

Given,	A	B	C
Diameter:	4′	2′	4′
Length(thickness):	2′	6′	2′
Unit weight (lb/ft^3):	900	490	900

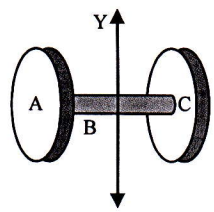


Figure 3

4. A homogeneous block of weight W rests upon the incline shown in ***Figure 4***. If the coefficient of friction is 0.30, determine the greatest height 'h' at which a force P parallel to the incline may be applied so that the block will slide up the incline without tipping over.

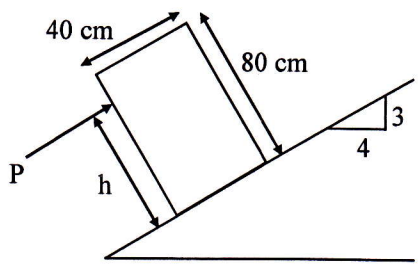


Figure 4

5. Messi kicked a ball and the ball flew in projectile motion with an initial angle of 60° to horizontal and initial velocity 10 m/s as shown in ***Figure 5***. The ball hit the crossbar which was 7.05 m away from him. Calculate the height 'h' of the crossbar.

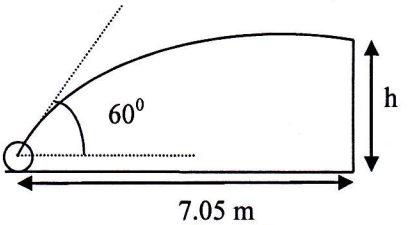


Figure 5

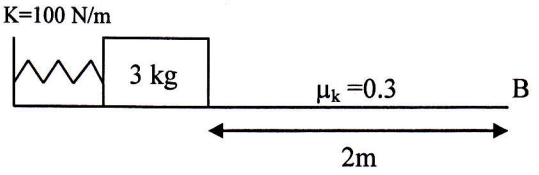


Figure 6

6. A spring (spring constant 100 N/m) is compressed 1m by a 3 kg block. When released, the block travels a path shown in ***Figure 6*** where coefficient of kinetic friction is 0.30. Apply work-energy principle to calculate velocity of the block at point 'B' which is 2 m away from the initial position.

7. A boy weighing 60 kg rides his skateboard following path ABC as shown in ***Figure 7***. He starts from rest at the top of the track at point 'A' and begins to descend down the track. The mass and friction of the skateboard are assumed negligible.
   (a) What is the boy's speed when he reaches the point 'B', 18.0 m below the starting point?
   (b) What is his speed when he reaches the point 'C'?

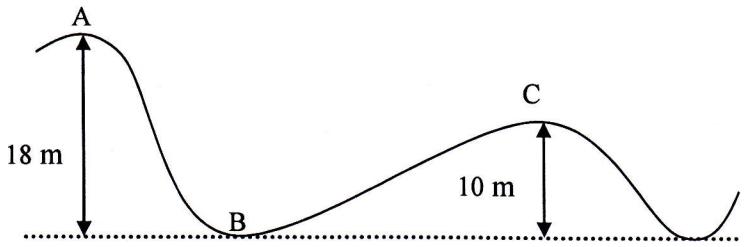


Figure 7

8. A body of mass 875 kg moving towards south, according to ***Figure 8***, at 15 m/s, is struck by another mass 1584 kg, moving towards east at 12 m/s. The two masses stick together, and momentum is conserved in the collision.What is the velocity of the combined mass after collisor?

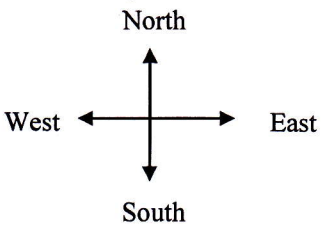


Figure 8

9. A block hits a straight rigid wall with 10 m/s velocity and just after direct central impact the block rebounds with a velocity of 7 m/s.
   If the impact time is 0.02 second, calculate a) impulse during impact
   b) impulsive force exterted by the wall
   c) co-efficient of restitution.

10. Calculate the work done by friction in slowing a 10.5 kg block travelling at 5.85 m/s to a rest at a distance of 9.65m. a) What is the kinetic coefficient of friction between the block and surface?
    b) How long does it take for the block to stop from initial velocity?

11. The drop hammer H weighs 900 lb and falls from rest and height h = 3 ft as shown in ***Figure 9***, onto a plate P that has a weight of 500 lb. The plate is mounted on a set of springs which have a combined stiffness of k_T = 500 lb/ft.
Calculate (a) the velocity of P and H just after collision
(b) the maximum compression in the springs caused by the impact.
The coefficient of restitution between the hammer and the plate is e = 0.60.

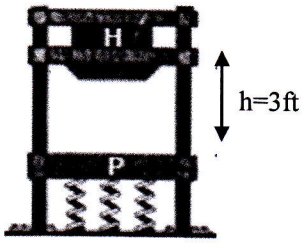


Figure 9

12. The bodies A and B, shown in ***Figure 10*** weigh W_A= 65 lb, W_B= 30 lb with d_b= 0.5 ft, d_B= 1 ft. Rotating part C weighs 25 lb and has a radius of gyration 1.1 ft. with respect to its axis. Coefficient of kinetic friction for B and inclined surface is 0.2 and 0.33 respectively. If B moves 3 ft from rest, calculate velocity of A and B by applying work-energy principle.

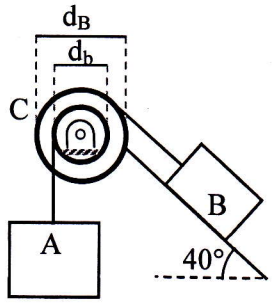


Figure 10

13. Calculate the magnitude of the concurrent forces F_A, F_B and F_C if their resultant is R= 122 lb with θ_x= 78°; θ_y= 75°; θ_z= 19°.
Given: A (F_A, -5, 8, 3); B (F_B, 4, -8, 5); C (F_C, 3, 7, -5).

14. Six parallel forces act on a concrete slab as shown in the ***Figure 11***. Determine the resultant of the forces and locate the intersection of the line of the resultant with the XY-plane.

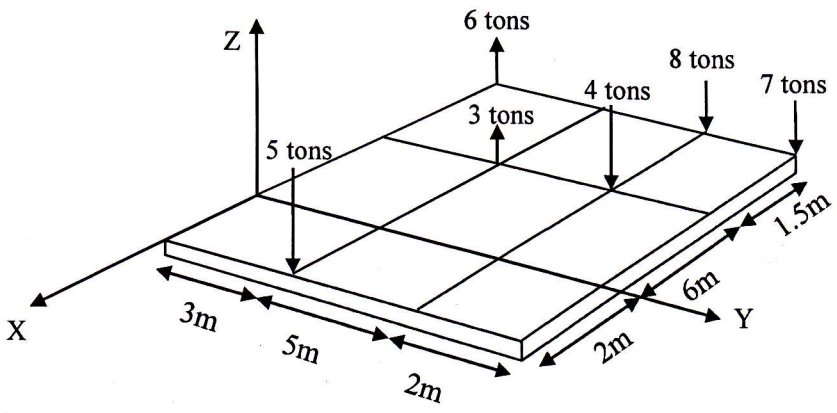


Figure 11

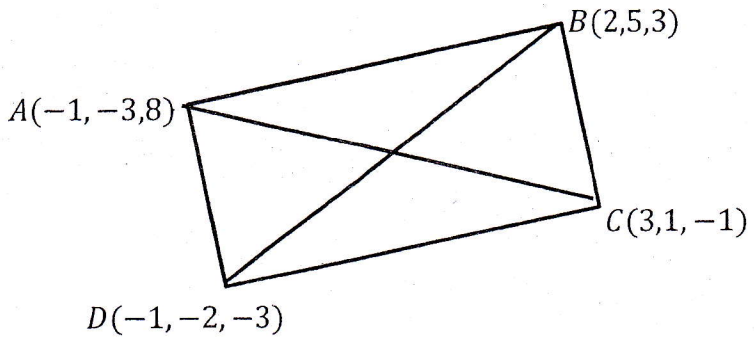
University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination Spring 2017
Program: B. Sc. in Civil Engineering

Course Title: Mathematics-II | Course Code: MTH 103
Time: 3.00 Hours. | Full Marks: 150

There are **Eight** questions. Answer any **Six**. All questions are of equal values indicated in the right margin.

1. **(a)** If the direction of axes is turned through an angle 30° and the origin remains unchanged, then find the transformation equation of $x^2 + 2\sqrt{3}xy - y^2 - 2a^2 = 0$, where a is a constant. **13**

   (b) Find the direction ratios of all the sides of the quadrilateral including the diagonals. Then find all four interior angles of the quadrilateral and angle between the diagonals. **12**



2. **(a)** Find the two tangent planes of the sphere $x^2 + y^2 + z^2 - 4x + 2y - 6z + 5 = 0$ which are parallel to the plane $2x + 2y = z$. **13**

   (b) Find the equation of the plane perpendicular to the planes $x - 4y + z = 0$ and $3x + 4y + z = 2$ and at a unit distance from the origin. **12**

3. **(a)** Find the distance of the point $(1,1,1)$ from the point where the line $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{6}$ cuts the plane $4x - 3y + 2z + 6 = 0$. **13**

   (b) 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. **12**

4. **(a)** Determine the perpendicularity and parallelism between the straight lines given below **12**

   (i) $2x + 3y - 4z = 0 = 3x - 4y + z$ and $5x - y - 3z + 12 = 0 = x - 7y + 5z - 6$

   (ii) $3x - 2y + 13 = 0 = y + 3z - 26$ and $\frac{x+4}{5} = \frac{y-1}{-3} = \frac{z-3}{1}$

   (b) Show that the four points are coplanar $(0,-1,-1), (4,5,1), (3,9,4)$ and $(-4,4,4)$. **13**

5. **(a)** Find the unit tangent vector and unit normal vector at $t = 0$ of the curve
$$x = e^t \cos t,\ y = e^t \sin t,\ z = e^t$$ **15**

(b) If $\vec{A}(x,y,z) = xy\,\hat{\imath} - yz\hat{\jmath} + zx\hat{k}$ and $\varphi(x,y,z) = xyz$, find $\frac{\partial^3}{\partial x^2 \partial z}(\varphi\vec{A})$ at (1,1,1). **10**

6. **(a)** Prove that, $\vec{\nabla}^2\left(\frac{1}{|\vec{r}|}\right) = 0$ where $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$. **10**

(b) Show that $\varphi = 2y^2 + 3x^2y - xy^3$ is a potential function for **8**
$\vec{F} = (6xy - y^3)\hat{\imath} + (4y + 3x^2 - 3xy^2)\hat{\jmath}$
Also show that the vector field $\vec{F}$ is irrotational that is $curl\vec{F} = \mathbf{0}$ everywhere.

(c) Show that the vector field $\vec{F} = x^2z\,\hat{\imath} - 2y^3z^2\hat{\jmath} + xy^2z\hat{k}$ is divergent at the point $(3,-1,1)$, convergent at the point $(1,-1,1)$ and constant at $(0,0,0)$. **7**

7. **(a)** Evaluate the line integrals: **18**

(i) $\int_C (xy + z^3)ds$ from $(1,0,0)to\ (-1,0,\pi)$ along the helix

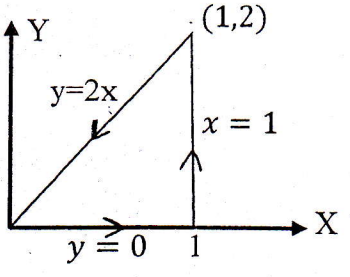
C: $\vec{r}(t) = \cos(t)\,\hat{\imath} + sin(t)\hat{\jmath} + t\hat{k} \quad (0 \le t \le \pi)$

(ii) $\int_C \vec{F}\cdot d\vec{r}$ where, $\vec{F} = 3xy\hat{\imath} - y^2\hat{\jmath}$ along C: the parabola $y = x^2$ from $(0,0)$ to $(1,1)$.

(b) Find the directional derivative of $\varphi(x,y,z) = x\sin(z) + y\sin(x) + z\sin(y)$ along the direction of the vector $\underline{a} = (3,4,0)$ at the point $(-\pi,0,\pi)$. **7**

8. **(a)** Using Divergent theorem to find the outward flux of the vector field **12**
$\vec{F} = 4xz\hat{\imath} - y^2\hat{\jmath} + yz\hat{k}$ across the unit cube.

(b) Use Green's theorem to evaluate $\int_C (x^2ydx + xdy)$ along the path shown in figure **13**



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

Course Code: HSS 103 Course Title: English Language II

Time: 3.00 Hours Full Marks: 50

* Marks are indicated in the right margin

1. Read the following passage.

Have you ever looked out of the window of a passenger plane from 30,000 feet at the vast blue Ocean and uninhabited land, and wondered how people can have any major effect on the Earth? I have. But it is now becoming pretty clear that we are causing a great deal of damage to the natural environment. And the planes which rush us in comfort to destinations around the globe, contribute to one of the biggest environmental problems that we face today – global warming. Unfortunately, planes produce far more carbon dioxide (CO_2) than any other form of public transport, and CO_2 is now known to be a greenhouse gas, a gas which traps the heat of the sun, causing the temperature of the Earth to rise. Scientists predict that in the near future the climate in Britain will resemble that of the Mediterranean, ironically a popular destination for British holidaymakers flying off to seek the sun. If global warming continues, we may also find that many tourist destinations such as *The Maldives* have disappeared under water because of rising sea levels. Mrs. Beatrice, a spokeswoman for the *European Federation for Environment* says that, "One person flying in an airplane for one hour is responsible for the same greenhouse gas emissions as a typical Bangladeshi in a whole year." And every year jet aircraft generate almost as much carbon dioxide as the entire African continent produces. Under the "polluter pays principle", where users pay for the bad effects they cause, the damage caused by planes is not being paid for. Aircraft fuel is not taxed on international flights and planes, unlike cars, are not inspected for CO_2 emissions.
So what can be done to solve the problem? Well, although aircraft engine manufacturers are making more efficient engines, it will be decades before air travel is not damaging to the environment. The most obvious way of dealing with the problem is to not travel by plane at all. Environmental groups encourage people to travel by train and plan holidays nearer home. However with prices of flights at an all-time low, and exotic destinations more popular than ever, it is hard to persuade British tourists, for example, to choose Blackpool instead of Bangkok. Some groups also advise using teleconferencing for international business meetings, instead of meeting face-to-face. A company called *Future Forests* offers a service which can relieve the guilty consciences of air travellers. The Future Forest website calculates the amount of CO_2 you are responsible for producing on your flight and for a small fee will plant the number of trees which will absorb this CO_2.

Now, answer the following questions in a single sentence. **5x1=5**

a) What is greenhouse gas?
b) How are airplanes responsible for global warming?
c) What will happen to the tourist spots if global warming continues?
d) Explain "polluter pays principle".
e) How can air-travellers help to protect the environment?

2. Complete **any FIVE (05)** of the sentences using appropriate Modal verbs. **5x1=5**

a) _____ you please give me the doctor's telephone number?.
b) It _____ rain during the night.
c) You _____ wear a helmet while riding a motorbike.
d) I _____ mail you my address.
e) _____ you have a long live.
f) _____ I come in?
g) _____ you please tell me the direction to the hotel?

3. Join **any TEN (10)** of the following pairs of sentences with appropriate conjunctions or relative pronouns. **10x1=10**

a) I used torchlight. It was very dark by then.
b) She went to see the manager personally. She had a very serious complaint to make.
c) We had waited for you for a long time. You did not turn up at all.
d) He was very pleased with himself. He had won first prize in the competition.
e) You must come early. We will have time to make all the arrangements.
f) The boys are afraid to go near that place. They have heard that it is haunted.
g) I could not find him in his own house. I went over to Tomal's house to see if he was there.
h) The bull rushed straight at the little boy. He quickly moved to one side.
i) I shouted for help as loudly as I could. No one heard me.
j) The girl did not buy that expensive pair of shoes. She liked them very much.
k) He walked out of the room very angrily. He slammed the door hard.
l) Robert locked himself in my bedroom. He would not be disturbed by the children.

4. **Review** a movie that you have watched recently. (150 words) **05**

5. Write a **Memorandum** as the Managing Director of Aarong Fashion Ltd informing all staff about the performance bonus which will be given by you on August 2017 based on some qualifications. **05**

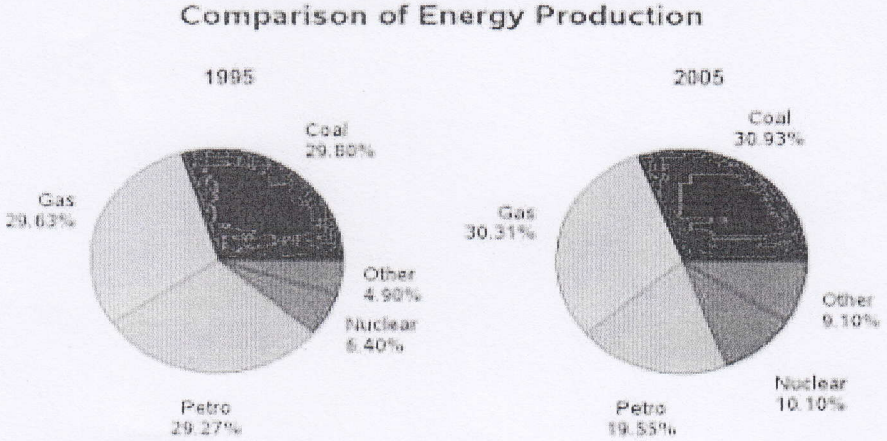
6. Recently road accidents have increased dramatically throughout the country. As a reporter of *The Daily Star*, write **an investigation report** on the causes and probable solutions of road accidents. (150 words) **05**

7. Write an essay on **any ONE (01)** of the following topics (at least 250 words) **10**

a) A life with internet and without internet

b) A memorable day

8. Describe and analyze the information shown in the charts in your own words. The pie charts below show the comparison of different kinds of energy productions of France in two years. **05**



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

Course Title: Chemistry | Course Code: CHEM 111
Time: 3 hours | Full Marks: 150

.....

Section: A

There are FOUR questions in this section. Answer any THREE

1 (a) What do you mean by Van't Hoff factor? What information does this quantity provide? [9]

(b) How does a sol differ from a gel? Explain [6]

(c) What is Henry's Law? Explain the law in terms of the kinetic molecular theory of gases. Give an exception to Henry's law. [10]

2(a) Why salt is sprinkled on the ice on frozen roads? [6]

(b) What are the colligative properties? Why the vapour pressure of a solution is less than that of its pure solvent? [9]

(c) Calculate the molality of a 35.4 percent (by mass) aqueous solution of phosphoric acid (H_3PO_4). The molar mass of phosphoric acid is 97.99 g. [10]

3 (a) Enthalpy is a state function. Explain. [8]

(b) Describe the processes of coal gasification and coal liquefaction. [8]

(c) Calculate the standard enthalpy of formation of acetylene (C_2H_2) from its elements: [9]

$2C(\text{graphite}) + H_2(g) \longrightarrow C_2H_2(g)$

The equations for each step and the corresponding enthalpy changes are

(a) $C(\text{graphite}) + O_2(g) \longrightarrow CO_2(g)$ $\quad \Delta H^\circ_{rxn} = -393.5$ kJ/mol

(b) $H_2(g) + \frac{1}{2} O_2(g) \longrightarrow H_2O(l)$ $\quad \Delta H^\circ_{rxn} = -285.8$ kJ/mol

(c) $2C_2H_2(g) + 5O_2(g) \longrightarrow 4CO_2(g) + 2H_2O(l)$ $\quad \Delta H^\circ_{rxn} = -2598.8$ kJ/mol

4 (a) What is Fuel. Describe three fuel-oxidizer systems used in rockets. [8]

(b) In writing thermochemical equations, why is it important to indicate the physical state (that is, gaseous,liquid, solid, or aqueous) of each substance? [8]

(c) A lead (Pb) pellet having a mass of 26.47 g at 89.98°C was placed in a constant-pressure calorimeter of negligible heat capacity containing 100.0 mL of water. The water temperature rose from 22.50°C to 23.17°C. What is the specific heat of the lead pellet? [9]

Section: B

There are FOUR questions in this section. Answer any THREE

5 (a) The rate law for the decomposition of N_2O_5 (l) is : rate = k $[N_2O_5]$ where k = 6.22×10^{-4} sec^{-1}. Calculate half-life of N_2O_5 (l) and the number of seconds it will take for an initial concentration of N_2O_5 (l) of 0.100 M to drop to 0.0100 M. [12]

(b) Find out the unit of rate constant from the expression of third order rate constant. [5]

(c) Show that for first order reactions the half-life period is independent of the initial concentration. [8]

6 (a) Draw a well labelled phase diagram of water system and discuss its salient features. [15]

(b) Explain the terms (i) Phase (ii) Component (iii) Degree of freedom. How are they related? [10]

7 (a) Name different methods to determine the order of a reactions and describe the graphical method for the determination of order of reaction. [10]

(b) What are the differences between molecularity and order of reaction? [7]

(c) The optical rotation of sucrose in 0.9N HCl at various time intervals is given in the table below. [8]

time (min)	0	7.18	18	27.1	∞
rotation (degree)	+24.09	+21.4	+17.7	+15	−10.74

Show that inversion of sucrose is a first order reaction.

8 (a) Define Enantiotropy, Monotropy and Dynamic allotropy with a suitable example. [9]

(b) How jam and jelly are preserved? [6]

(c) Define micelle. Show the cleaning mechanism of soaps. [10]