

SECTION – AThere are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Derive the Lorentz transformation equations. Show that for low velocity, Lorentz transformation approaches to Galilean transformation. (25)
- (b) The relativistic energy and momentum of a body are (10)
- $$E = \frac{m_0 c^2}{\sqrt{1 - \frac{v^2}{c^2}}} \text{ and } P = \frac{m_0 v}{\sqrt{1 - \frac{v^2}{c^2}}} \text{ respectively.}$$
- Show that the relativistic energy for all particles is $E = \sqrt{m_0^2 c^4 + P^2 c^2}$ and the energy of a mass-less particle (photon) is $E = Pc$.
2. (a) Describe photo-electric effect. (18)
- (b) What is de-Broglie hypothesis? Derive an expression for the wavelength of a matter wave. (9)
- (c) When a photon of wavelength 3000 Å incident on a metal surface then the energy of the ejected electron is 2.8×10^{-19} J and for wavelength 6000 Å the energy of the ejected electron is 0.7×10^{-19} J. Calculate the value of Planck's constant and the threshold frequency of the metal. (8)
3. (a) Write a short note on stellar energy. (5)
- (b) Calculate the energy released by fission process for a single Uranium atom. Calculate the energy released by 20 gms of Uranium in KWH. Given, mass of $^{235}\text{U} = 235.0457$ amu, mass of $n = 1.0087$ amu, mass of $^{141}\text{Ba} = 140.9177$ amu and mass of $^{92}\text{Kr} = 91.8851$ amu. Avogadro's number = 6.023×10^{23} mole⁻¹. (10)
- (c) Define average life time of a radioactive element? Obtain an expression for the average life time of a radioactive element. (20)
4. (a) Define electric field E for a point charge Q. (4)
- (b) Calculate the magnitude of electric field E for an electric dipole at point P at a perpendicular distance r from the center of the dipole. (12)
- (c) State and explain Gauss's law in electrostatics. (4)
- (d) Show that Coulomb's law is a special case of Gauss's law. (10)
- (e) Gauss's law can tell us how much charge is contained within a Gaussian surface. Can it tell us exactly where inside the surface charge is located? (2)

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(d) Of two point charges q_1 and q_2 , charge q_1 is inside a closed Gaussian surface and charge q_2 is just outside the surface. Does the electric flux through the surface depend on q_2 ? Explain your answer. (3)

SECTION - B

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

5. (a) State and explain Ampere's law. (4)
- (b) A cylindrical conducting wire of radius R carries current I distributed uniformly across the cross-section. Using Ampere's law calculate the magnetic field B at a distance r from the centre of the wire for the following cases: (15)
- (i) Outside ($r > R$)
 - (ii) Inside ($r < R$)
 - (iii) Surface ($r = R$) of the wire.
- (c) What is a dielectric material? (4)
- (d) Do you agree or disagree with the following statement? Placing a dielectric material between the plates of a parallel plate capacitor has the effect of increasing the capacitance of that capacitor. Use details to explain your answer. (12)
6. (a) Write down the four Maxwell's equations of electromagnetism. Mention the physical significance of any two of them. (10)
- (b) What is magnetic Levitation or Maglev? Mention some ways you can levitate an object. Explain briefly one of those techniques. Give an example of using magnetic levitation in our modern technological world. (13)
- (c) The charged particle originated from solar wind deflected by earth's magnetic field and produce Aurora. Explain briefly about "Aurora". (12)
7. (a) Derive the relationships between unit cell edge length and atomic radius for face-centered cubic, body-centered cubic and simple cubic crystals with neat diagrams. (15)
- (b) What is packing factor? Calculate packing factors for BCC and FCC crystals. (12)
- (c) Show that the theoretical density of a cubical crystal is $\rho = \frac{1}{a^3} \cdot n \cdot \frac{M_A}{N_A}$ where a is the lattice constant, n is the number of atoms per unit cell, M_A is the atomic weight of the material, and N_A is the Avogadro's number. (8)
8. (a) Why the interatomic bond exists in solids? Briefly explain various types of bonds that exist in solids. (12)
- (b) Distinguish between cohesive energy and lattice energy of ionic crystals. Derive an expression for lattice energy for a typical ionic crystal. (16)
- (c) Sketch (110) plane of α -Fe crystal, which is body centered cubic. Atomic radius of α -Fe is 0.1243 nm. What is the area of this plane? Calculate number of atoms/mm³ of (110) plane of this crystal. (7)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2013-2014

Sub : **HUM 211** (Sociology)

Full Marks : 140

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this section. Answer any **THREE**.

1. (a) What do you mean by environment and pollution? (4)
 (b) Briefly discuss the negative impacts of global warming. (8)
 (c) Define physical environment. Briefly discuss how the socio-economic development depends on physical environment. (11 1/3)
2. (a) Define human migration. What is meant by 'pull factor' and 'push factor' in migration? Cite examples from Bangladesh. (8)
 (b) Critically discuss the evolution of cities. (7 1/3)
 (c) Write down different sources of social change in the context of Bangladesh. (8)
3. (a) How do you define crude birth-rate and crude death-rate? Describe the stages of demographic transition theory. (13 1/3)
 (b) 'Private property is the terra ferma of capitalism' – Explain this statement on the basis of nature of capitalism. (10)
4. Write short notes on any **THREE** of the following: (23 1/3)
 - (a) Environmental justice
 - (b) Disposable society
 - (c) Green category industry and red category industry
 - (d) Globalization and modern life.

SECTION – BThere are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Explain how sociologists think themselves away from the familiar routines of daily lives through sociological imagination. (13 1/3)
 (b) Discuss the relationship between sociology and other social sciences. (10)

HUM 211 (IPE)

6. (a) 'Language manifests cultural traits of a society' – Explain. (10)
(b) What is dominant ideology? How does conflict perspective examine the influence of dominant ideology in the cultural practices of a society? (13 1/3)
7. (a) How does socialization shape human behaviour? Critically evaluate the roles of family, peer group and educational institution as the agents of socialization. (13 1/3)
(b) Discuss G. H. Meads theory of socialization. (10)
8. (a) What do you understand by social stratification? Explain different systems of social stratification with suitable examples. (13 1/3)
(b) Is stratification universal? Write your answer highlighting G. Lenski's theory of social stratification. (10)
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BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2013-2014

Sub : **MATH 191** (Differential and Integral Calculus)

Full Marks : 280

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this section. Answer any **THREE**.

Symbols used have their usual meaning.

1. (a) A function
- $f(x)$
- is defined as follows:

(20 $\frac{2}{3}$)

$$f(x) = \begin{cases} x^2 + 1 & \text{when } 0 \leq x < \frac{1}{2} \\ 0 & \text{when } x = \frac{1}{2} \\ x + 3 & \text{when } \frac{1}{2} < x \leq 1 \end{cases}$$

Discuss the continuity and differentiability of the function $f(x)$ at $x = \frac{1}{2}$. Also sketch the graph of $f(x)$.

- (b) Evaluate the following:

$$(i) \lim_{x \rightarrow 0} (1 + x)^{\frac{1}{x}} \quad (15)$$

$$(ii) \lim_{x \rightarrow 0} \frac{x - |x|}{x} \quad (11)$$

2. (a) Find
- $(y_n)_0$
- when
- $y = \sin(a \sin^{-1} x)$
- .

(21 $\frac{2}{3}$)

$$(b) \text{ If } u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right) \text{ then show that } xu_x + yu_y = 0. \quad (15)$$

$$(c) \text{ Expand } \ln x \text{ in powers of } (x - 2). \quad (10)$$

3. (a) Find the equation of the tangent and normal to the curve
- $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$
- at the point
- (x_1, y_1)
- . Also show that the portion of the tangent at
- (x_1, y_1)
- intercepted between the axes is of constant length.

(21 $\frac{2}{3}$)

$$(b) \text{ Show that } f(\theta) = \sin^p \theta \cos^q \theta \text{ attains a maximum when } \theta = \tan^{-1} \frac{p}{q}. \quad (15)$$

$$(c) \text{ Find the center of curvature of the curve } xy = 12 \text{ at the point } (3, 4). \quad (10)$$

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MATH 191 (IPE)

4. (a) Show that maximum rectangle that can be inscribed in a circle is a square. (15)
- (b) Find all asymptotes of the curve $y^3 - 5xy^2 + 8x^2y - 4x^3 - 4y^2 + 12xy - 8x^2 + 3y - 3x + 2 = 0$. (15)
- (c) State Rolle's theorem. Verify Rolle's theorem for the function $f(x) = x^3 - 3x^2 + 2x$ on the interval $[0, 2]$. If applicable, find all the values of c on $[0, 2]$. (16 $\frac{2}{3}$)

SECTION - B

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

5. Carry out the following integrals: (14+15+17 $\frac{2}{3}$)

(a) $\int \frac{dx}{\sqrt{x}(1+x)^{5/2}}$, (b) $\int \frac{dx}{4+5\sin x}$ (c) $\int e^{ax} \cos(bx+c) dx$

6. (a) Obtain a reduction formula for $I_n = \int x \cos^n x dx$ and hence obtain $\int x \cos^3 x dx$. (18)

(b) Evaluate: $\int_0^1 \tan^{-1} \sqrt{x} dx$. (11)

(c) Evaluate: $\int_0^{\pi/2} \log \cos x dx$. (17 $\frac{2}{3}$)

7. (a) Evaluate: $\int_{-\infty}^{\infty} \frac{dx}{x^2 + 2x + 2}$. (12)

(b) Prove that $\Gamma(\frac{1}{2}) = \sqrt{\pi}$. (18)

(c) Find the area interior to $y^2 = 2ax - x^2$ and exterior to $y^2 = ax$ lying in the first quadrant. Hence find the total area. (16 $\frac{2}{3}$)

8. (a) Find the area of a loop of the curve $r = a \cos 2\theta$. (10 $\frac{2}{3}$)

(b) Determine the perimeter of the loop of the curve $3ay^2 = x^2(a-x)$. (18)

(c) Find the volume of the solid formed by the revolution about x-axis of a loop of the curve $y^2(a+x) = x^2(3a-x)$. (18)

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L-1/T-1/IPE

Date : 11/12/2014

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2013-2014

Sub : **CHEM 119** (Chemistry I)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION - A

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

1. (a) Briefly describe the Bohr's theory of hydrogen atom and explain how the theory can explain the line spectra of hydrogen. (6+10=16)
(b) How Schrodinger introduces the concept of 'atomic orbital'? (10)
(c) Rank each set of ions in order of decreasing size, and explain your ranking (9)
(i) Ca^{2+} , Sr^{2+} , Mg^{2+} (ii) K^+ , S^{2-} , Cl^- (iii) Au^+ , Au^{++}

2. (a) Draw the potential energy diagram for the formation of covalent bond and from the diagram define 'bond length' and 'bond dissociation energy'. (10)
(b) Explain that the ionic bond is an extreme case of polar covalent bond. (9)
(c) What is VSEPR theory? Predict and draw the geometry of the followings. (2+9=11)
(i) XeO_2F_2 (ii) IF_2^- (iii) ICl_4^-
(d) What is hybridized state of carbon in carbonyl group ($>\text{C} = \text{O}$) (5)

3. (a) Explain with molecular orbital diagram that He_2^+ exist but He_2 not. (8)
(b) Using the molecular orbital diagram show that CN is paramagnetic but CN^- is diamagnetic. Show the electron distribution of both the CN and CN^- . (12)
(c) What is shielding effect? How is shielding effect related with effective nuclear charge? How the effective nuclear charge change if you move from Li (3) to Ne (10) in the first period? Explain. (5+5+5=15)

4. (a) What are order with respect to concentration (n_c) and order with respect to time (n_t)? Discuss the principle of determination of n_c for a reaction (4+8=12)
$$\text{A} \longrightarrow \text{P}$$

(b) Discuss the advantages and disadvantages of differential and integration methods for determination of order of a reaction. (8)
(c) What are the factors that affect the rate of the reaction? Discuss the effect of (i) temperature and (ii) catalyst on the rate of reaction. (4+6+5=15)

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CHEM 119**SECTION – B**

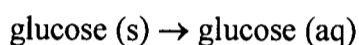
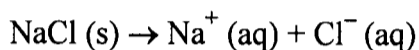
There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Briefly discuss the effects of lattice energy and hydration energy on the solution process of ionic solids. (6+4)

Suppose, the lattice energy of a hypothetical ionic compound, AB is x kJ/mol, and the hydration energies of A^+ and B^- are $-y$ kJ/mol and $-z$ kJ/mol, respectively. What would you expect about the solubility of AB in water if $x > (y + z)$?

- (b) State the principle of fractional distillation process to separate a solution of two liquids into pure components. (5)

- (c) When equal molar amounts of NaCl and glucose are placed in separate 500 mL samples of water, they undergo the following reactions: (4+3+3)



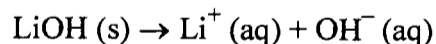
(i) What will happen to the boiling point of the solutions compare to that of pure water? Which solution would you expect to have the lower boiling point? Why?

(ii) Describe a procedure that would make the two solutions have the same boiling point.

(iii) The container of glucose (aq) is left out on the bench top for several days, which allows some of the water to evaporate from the solution. How would the melting point of this solution be compared to the melting point of the original glucose solution? Explain.

- (d) Fish blood has an osmotic pressure equal to that of seawater. If seawater freezes at -2.3°C , what is the osmotic pressure of the blood at 25°C ? Assume that the Van't Hoff factor, i , for seawater is 2.0, and the density of seawater is 1.0 g/mL. Given that K_b and K_f of water are 0.512°C/m and 1.858°C/m , respectively. (10)

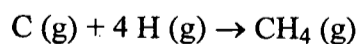
6. (a) Describe a simple coffee cup calorimeter. In a calorimetric experiment, 6.48 g of LiOH was dissolved in water. The temperature of the calorimeter rose from 25.00°C to 36.66°C . What is ΔH for the solution process? (5+5)



The heat capacity of the calorimeter and its contents is $547 \text{ J/}^\circ\text{C}$.

(b) What is meant by the standard enthalpy of formation of a substance?

Is the following reaction the appropriate one to use in determining the enthalpy of formation of methane, CH_4 (g)? Why or why not? (4+4)



(c) What is meant by pressure-volume work? Describe how it relates the enthalpy change to internal energy change. (4+5)

(d) Using the concept of self-ionization of water, determine the pH of pure water at 25°C . Given that the ion-product constant for water, K_w , is 1.0×10^{-14} at 25°C . (8)

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7. (a) Sketch the phase diagram for CO₂. Calculate the degrees of freedom, F. For all regions, curves and points (if any) on the diagram. (4+6)
- (b) Define critical temperature and pressure. Which of the following gases will be liquefied at room temperature by simply compressing the gas? (4+3)
- (i) CH₃Cl (critical point, 144°C, 66 atm)
- (ii) O₂ (critical point, -119°C, 50 atm)
- (c) Differentiate between electrolytic cell and Galvanic cell. (5)
- (d) An electrochemical cell is represented as (4+8+1)
- Ag. Ag Cl (s)|Cl⁻ (0.05 mol L⁻¹) || Fe³⁺ (0.10 mol L⁻¹)|Fe²⁺ (0.02 mol L⁻¹), Pt
- (i) Write the electrode reactions and identify the redox electrode.
- (ii) If the standard reduction potentials are 0.2225 V and 0.7710 V for left and right electrodes, respectively, calculate the e.m.f. of the cell and comment on the spontaneity of the cell reaction.
8. (a) Discuss the effect of temperature on the position of the equilibrium and the value of the equilibrium constant. (8)
- (b) Explain why ammonia synthesis by Haber process is carried out at 450°C and at 200 atm pressure. (8)
- (c) Derive an equation of pH for hydrolysis of a salt formed by a weak base and a strong acid. (9)
- (d) The pH of 0.05 mol L⁻¹ solution of acetic acid is 3.03. (i) Calculate the acid dissociation constant (K_a) of the acid and (ii) Using the value of K_a, calculate the pH of a solution of sodium acetate of concentration 0.02 mol L⁻¹. (10)
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L-1/T-1/IPE

Date : 03/01/2015

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2013-2014

Sub : **IPE 105** (Principles of Cost and Management Accounting)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION - A

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

1. (a) Mention the benefits and limitations of activity based costing system. (10)

(b) A company manufactures two products, A and B. Data regarding the two products are as follows: (25)

Product	Direct Labor-Hours Per Unit	Annual Production
A	1.8	5,000 Units
B	0.9	30,000 Units

Product A requires \$72 in direct materials per unit and product B requires \$50 per unit. The direct labor rate is \$10 per unit hours. The company has always used direct labor hours as the base for allocating manufacturing overhead cost. Manufacturing overhead cost is \$28,70,000 per year. Product A requires special equipment and machining time much higher than Product B. The company is considering to use activity based costing system to apply overhead costs to products, Five activity centers have been identified as follows:

Activity Center	Cost Driver	Traceable Costs	Annual Transactions		
			Total	Product A	Product B
Machine Setups	Number of Setups	5,50,000	225	70	155
Special Processing	CPU Minutes	4,80,000	12,000	10,000	2,000
General Factory	Direct Labor Hours	12,60,000			
Initial Product Tests	Number of Tests	1,00,000	20	8	12
Transportation	Number of Truckloads	4,80,000	780	230	550

(i) Using direct-labor hours as the base for allocating manufacturing overhead costs - fills the blank cells in the above table, compute the predetermined overhead rate, and determine the cost to produce each unit of product.

(ii) Assume that the company decides to use activity based costing to apply overhead costs to products - classify the activity centers to different level of activities, compute the amount of overhead cost that would be applied to each product, and determine the cost to produce each unit of product.

(iii) Explain why overhead cost shifted from the high-volume product to the low-volume product under activity-based costing.

Contd P/2

IPE 105

2. (a) Define true variable and step variable costs with examples. (4)
 (b) Explain the term 'fixed cost and relevant range' with examples. (6)
 (c) A retail company has several autos that have been purchased for use by the sales staff. All expenses of operating these autos have been entered into an "Automobile Expense" account on the company's account book. Along with this record of expense, the company has also kept a record of the number of miles the autos have been driven each month. The records for the last twelve months are given below: (25)

Month	Total Mileage (in thousands)	Total Cost
January	4	\$5,600
February	8	11,000
March	7	10,400
April	12	14,800
May	6	6,800
June	11	13,900
July	14	14,950
August	10	12,000
September	13	14,000
October	15	16,200
November	9	11,700
December	16	17,300

The president wants to know the cost of operating the fleet of autos in terms of the fixed monthly cost and the variable cost per mile driven.

- (i) Prepare a scatter graph using the data given above and compute the approximate fixed and variable cost per month.
 (ii) Compute the fixed cost and variable cost using least square regression method. Estimate the total cost if total mileage is 20000 miles.
3. (a) Define operating leverage and explain the significance of it. (5)
 (b) A cricket ball manufacturing company sells a ball for \$25. The ball is manufactured in a small plant that relies heavily on direct labor workers. Thus, variable costs are high, totaling \$15 per ball. Last year, the company sold 30,000 balls. Total fixed expenses was \$2,10,000. (30)
 (i) Compute the contribution margin (CM), the net income, the CM ratio, the break-even point in units and sales, and the operating leverage at last year's levels of sales.
 (ii) Due to an increase in labor rates, the company estimates that variable costs will increase by \$3 per unit from net year. If this change takes place and the selling price per ball remains same, what will be the new CM ratio, the break-even point in units and sales, and the net income?
 (iii) Refer to the data in (ii) above, if the expected change in variable costs takes place, how many will have to be sold next year to earn the same net income as last year?

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Contd ... Q. No. 3(b)

(iv) Refer again to the data in (ii) above, the president feels that the company must raise the selling price of the balls. If the company wants to maintain the same CM ratio as last year, what selling price per ball should be charged to cover the increased labor costs?

(v) Refer to the original data, the company is discussing the construction of a new, automated plant to manufacture balls. The new plant would slash variable costs per ball by 40%, but it would cause fixed costs to double in amount per year. If the new plant is built, what would be the new CM ratio and new break-even point in units and sales? How many balls will have to be sold to earn the same net income as last year?

(vi) Refer to the data in (v) above, prepare a contribution income statement assuming that the new plant is built and the company manufactures and sells 30,000 balls and compute the operating leverage. Explain the change in operating leverage from last year. Comment about building the new plant.

4. (a) Mention the advantages of budgeting. (5)

(b) What is a master budget? Show schematically the interrelations among different budgets in a master budget. (2+4=6)

(c) A financial statement for Company B is as follows: (24)

Company B
Monthly Income Statements

	October	November	December
Production units	85,000	80,000	60,000
Sales (@ \$25)	17,50,000	18,75,000	20,00,000
Less cost of goods sold:			
Beginning inventory	80,000	3,20,000	4,00,000
Cost applied to production			
Variable manufacturing costs (@ \$9)	7,65,000	7,20,000	5,40,000
Fixed manufacturing overhead cost	5,95,000	5,60,000	4,20,000
Cost of goods manufactured	13,60,000	12,80,000	9,60,000
Goods available for sale	14,40,000	16,00,000	13,60,000
Less ending inventory	3,20,000	4,00,000	80,000
Cost of goods sold	11,20,000	12,00,000	12,80,000
Under-applied or (over-applied) overhead cost	(35,000)	---	1,40,000
Adjusted cost of goods sold	10,85,000	12,00,000	14,20,000
Gross margin	6,65,000	6,75,000	5,80,000
Less selling and administrative expenses	6,20,000	6,50,000	6,80,000
Net income (loss)	45,000	25,000	(1,00,000)

* Production units and sales in units might be different for each month. Sales in units for each month can be computed from the information in the above table.

IPE 105

Contd ... Q. No. 4(c)

Additional information for the company's operations is given below:

5000 units were in inventory on October 1. Fixed manufacturing overhead costs are \$16,80,000 per quarter and applied to each month according to budgeted production volume of 80,000 units. Variable selling and administrative expenses are \$6 per unit sold. The remainder of the selling and administrative expenses on the statement above is fixed. The company uses a FIFO (first in first out) inventory flow.

- (i) Prepare an income statement for each month using variable costing approach.
- (ii) Compute the month breakeven points in units under variable and absorption costing.
- (iii) Explain why net income have moved erratically over the three month period shown in the financial statement given above and why profits have not been more closely correlated with changes in sales volume.
- (iv) Reconcile the variable costing and absorption costing net income (loss) figures for each month (show all computations).

SECTION - B

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

- 5. A company was organized on March 1 of the current year. After five months of start-up losses, management has expected to earn a profit during August. However the income statement for August also showed a loss.

(35)

Income statement for August

Sales		\$450,000
Less operating expenses:		
Indirect labor cost	\$12,000	
Utilities	15,000	
Direct labor cost	70,000	
Depreciation, Factory	21,000	
Raw materials purchased	165,000	
Depreciation, sales equipment	18,000	
Insurance	4,000	
Rent on facilities	50,000	
Selling and Administrative salaries	32,000	
Advertising	75,000	<u>462,000</u>
Net loss		\$ (12,000)

After seeing \$12,000 loss, management decided to sell the company.

Additional information about the company follows:

- (i) Some sixty percent of the utilities cost and 75% of the insurance apply to factory operation. The remaining amounts apply to selling and administrative activities.
- (ii) The inventory balance at the beginning and ending of August were

	<u>August 1</u>	<u>August 31</u>
Raw material	\$ 8,000	\$ 13,000
Work-in-process	16,000	21,000
Finished goods	40,000	60,000

Contd P/5

IPE 105

Contd ... Q. No. 5

(iii) Only 80% of the rent on facilities applies to factory operations, the reminder applies to selling and administrative facilities.

Management has asked you to check over the income statement and make a recommendation whether to sell the company or not.

Required:

- (a) Prepare a schedule for cost of goods manufactured.
- (b) Prepare a new income statement for August.
- (c) Based on the statement prepared in (a) and (b), what is your recommendation about selling the company?

6. A small law firms contains 10 partners and 12 support persons. The firm employs a job-order costing system to accumulate costs chargeable to each client, and it is organized into two departments - Research & Documents department and Litigation department. The firm uses predetermined overhead rates to charge the costs of these departments to its clients. At the beginning of the year, the firm's management made the following estimates for the year:

(35)

	<u>Department</u>	
	<u>Research & Document</u>	<u>Litigation</u>
Research hours	24,000	---
Direct attorney hours	9,000	18,000
Legal forms and supplies	\$ 16,000	\$ 5,000
Direct attorney cost	450,000	900,000
Overhead cost	840,000	360,000

The predetermined overhead rate in the Research and Documents department is based on research hours, and the rate in the Litigation department is based on direct attorney cost.

The costs charged to each client are made up of three elements: legal forms and supplies used, direct attorney costs incurred and an applied amount of overhead from each department in which work is performed on the case.

The following costs and time were recorded for a particular case:

	<u>Department</u>	
	<u>Research & Document</u>	<u>Litigation</u>
Research hours	26	---
Direct attorney hours	7	114
Legal forms and supplies	\$ 80	\$ 40
Direct attorney cost	350	5,700

Required:

- (a) Compute the predetermined overhead rate used during the year in the Research and Documents department and Litigation department.
- (b) Compute the total overhead cost applied to the mentioned case.
- (c) What should be the total cost charged to this case? Show computations by department and total.

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(d) At the end of the year, the firm's records reveal the following actual cost and operating data for all cases handled during the year:

	<u>Department</u>	
	<u>Research & Document</u>	<u>Litigation</u>
Research hours	26,000	---
Direct attorney hours	8,000	15,000
Legal forms and supplies	\$ 19,000	\$ 6,000
Direct attorney cost	400,000	750,000
Overhead cost	870,000	315,000

Determine the amount of under or overapplied overhead cost in each department for the year.

7. The year end balance of a company is

(35)

	<u>Units</u>	<u>Costs</u>
WIP Dec 31 (50% complete as to labor and O/H)	300,000	\$ 660,960
FG Dec 31	200,000	\$ 1009,800

Materials are added to production in the beginning of the manufacturing process, and O/H is applied to each product at the rate of 60% of direct labor cost. There is no finished goods inventory at the end of the year. Company's inventory and cost records are as follows:

	<u>Units</u>	<u>Costs</u>	
		<u>Material</u>	<u>Labor</u>
WIP Jan 1 (80% complete as to labor and O/H)	200,000	\$ 200,000	\$ 315,000
Units started into production	1,000,000		
Cost added during the year			
Material cost		\$ 1,300,000	
Labor cost			\$ 1,995,000
Units completed during this year	900,000		

(a) Determine the cost per equivalent unit for material, labor and overhead.

(b) Determine the amount of cost that should be assigned to the ending WIP and FG inventories.

(c) Show the cost reconciliation.

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8. (a) Discuss about the costs that are considered in making decisions about adding or dropping product lines. (10)
- (b) Define the following costs: (10)
- (i) Relevant cost
 - (ii) Differential cost
 - (iii) Sunk cost
 - (iv) Opportunity cost
- (c) Explain the trend of the costs towards fixed costs in a business organization. (7)
- (d) Mention the benefits and limitations of participative budgets. (8)
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