BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2012-2013

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 – A

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

1. (a) A function $f(x)$ is defined as follows: $(20\frac{2}{3})$

$$f(x) = \begin{cases} 4 + x^2 & when \quad 0 < x \le 4 \\ 4 & when \quad -1 \le x \le 0 \\ 1 + x & when \quad -4 \le x < -1 \end{cases}$$

Discuss the continuity of $f(x)$ at $x = -1$ and differentiability of the function $f(x)$ at $x = 0$.

Also sketch the graph of $f(x)$.

(b) Evaluate the following:

(i) $\lim\limits_{x \to 1} (1 - x^2)^{1/\log_e (1-x)}$ **(11)**

(ii) $\lim\limits_{x \to 0} \left[\dfrac{1}{x^2} - \dfrac{1}{\sin^2 x} \right]$.   **(15)**

2. (a) If $x = \sin\left(\dfrac{1}{m} \log_e y \right)$ show that $(1 - x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + m^2)y_n = 0$ and

find the value of y_n when $x = 0$. $(21\frac{2}{3})$

(b) If $u = \frac{x}{r^3}$ and $r^2 = x^2 + y^2 + z^2$ then find the value of $u_{xx} + u_{yy} + u_{zz}$.   **(15)**

(c) Expand $f(x) = e^x \sec x$ in a series of ascending powers of x.   **(10)**

3. (a) State Lagrange's Mean value theorem. In the Mean value theorem

$f(h) = f(0) + h f'(0) + \dfrac{h^2}{2!} f''(\theta h), \ 0 < \theta < 1$, find the value of θ, when $h = 1$ and

$f(x) = (1 - x)^{5/2}$. $(16\frac{2}{3})$

(b) Show that in the curve $a^2 y^5 = k(bx + c)^4$ the cube of the subtangent varies as the fifth

power of the subnormal.   **(15)**

(c) Find the volume of the greatest right circular cone that can be inscribed in a sphere of

radius a.   **(15)**

4. (a) Find the pedal equation of the curve $x^{2/3} + y^{2/3} = a^{2/3}$.   **(13)**

(b) Find the radius of curvature of the curve $x = a(\theta - \sin\theta), y = a(1 - \cos\theta)$.   **(13)**

(c) Find all asymptotes of the curve $4x^3 - x^2 y - 4xy^2 + y^3 + 3x^2 + 2xy - y^2 - 7x + 5 = 0$. $(20\frac{2}{3})$

MATH 191(IPE)

SECTION – B

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

5. Work out the following integrals:

   (a) $\int \dfrac{dx}{(x+1)\sqrt{1+2x-x^2}}$ **(15)**

   (b) $\int \dfrac{3\sin x - \cos x + 2}{\cos x + \sin x + 1}\,dx$ **(15)**

   (c) $\int (3x-1)\sqrt{x^2 - x + 1}\ dx$ **(16⅔)**

6. (a) Obtain a reduction formula for, $I_{m,n} = \int \sin^m x \cos nx\ dx$.

   Hence find $\int \sin^3 x \cos 2x\ dx$.   **(23)**

   (b) Prove that $\int_0^{\pi/2} \sin^p \theta \cos^q \theta\, d\theta = \dfrac{\Gamma\left(\frac{p+1}{2}\right)\Gamma\left(\frac{q+1}{2}\right)}{2\Gamma\left(\frac{p+q+2}{2}\right)}$ and use if to evaluate   **(23⅔)**

   $\int_0^{\pi/2} \sin^5 \theta \cos^6 \theta\, d\theta$.

7. (a) Evaluate $\int_0^\pi \dfrac{x \sin x}{1 + \cos^2 x}\,dx$ **(15)**

   (b) Evaluate the improper integral $\int_1^2 \dfrac{dx}{(x+1)\sqrt{x^2 -1}}$ **(15)**
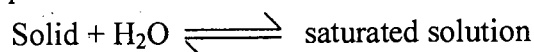
   (c) Evaluate $\lim\limits_{n\to\infty}\left[\dfrac{\sqrt{n}}{n^{3/2}} + \dfrac{\sqrt{n}}{(n+3)^{3/2}} + \dfrac{\sqrt{n}}{(n+6)^{3/2}} + ... + \dfrac{\sqrt{n}}{[n+3(n-1)]^{3/2}}\right]$.   **(16⅔)**

8. (a) Find the whole area bounded by the curve $a^2 y^2 = x^3(2a - x)$.   **(23)**

   (b) Find the surface area of the solid generated by revolving the curve $x = a(\theta +\sin \theta)$,

   $y = a (1 + \cos \theta)$ about the x - axis.   **(23⅔)**

L-1/T-1/IPE   Date : 01/10/2013

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2011-2012

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

Full Marks: 210   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

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

1. (a) What is 'dynamic equilibrium'? Discuss the effects of various stresses on the following dynamic equilibrium: **(3+12=15)**
    $$\text{Solid} + H_2O \rightleftharpoons \text{saturated solution}$$
    (b) State Bunsen's absorption co-efficient. Explain various forms of Henry's law to quantify the solubility of gases in liquid.   **(3+12=15)**
    (c) Calculate the concentration of nitrogen in water exposed to air at 25^0C; partial pressure of nitrogen is 0.781 atm. ($K'_{N_2} = 6.51 \times 10^7$ torr)   **(5)**
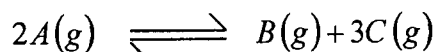
2. (a) State ideal and non-ideal solutions based on Raoult's law. How Raoult's law can be derived mathematically?   **(3+12=15)**
    (b) Consider two volatile liquids, A and B, are completely miscible at 30^0C. Express the equations of vapour when the systems behave ideally and non-ideally; also sketch and discuss the corresponding vapour pressure-composition curves both for ideal and non-ideal cases.   **(15)**
    (c) Explain why pyridine/formic acid liquid pair shows negative deviation from Raoult's law.   **(5)**

3. (a) Derive the expression for Thermodynamic equilibrium constant. How will you determine the value of ΔH^0 from equilibrium constant measurement?   **(20)**
    (b) Explain the effect of pressure and addition of an inert gas on the equilibrium: **(15)**
    $$2A(g) \rightleftharpoons B(g) + 3C(g)$$
    For the reaction, $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$ at 700^0C, K_c = 0.534. Calculate the number of moles of H_2 formed at equilibrium if a mixture of 0.300 mole of CO and 0.003 mole of H_2O is heated to 700^0C in a 10.0 L container.

4. (a) What is molal elevation constant (K_b)? Derive an expression for K_b relating molar mass (m) of a solute and boiling point elevation (ΔT).   **(3+12=15)**
    (b) Explain the quantitative effect of temperature on reaction rate. The rate constant for the second-order reaction $2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$ is 0.54 $M^{-1}s^{-1}$ at 300^0C. How long would it take for the concentration of NO_2 to decrease from 0.62 M to 0.28 M?   **(15)**
    (c) The heat of reaction for the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$ at 27^0C was found to be -21.976 kcal. What will be the heat of reaction at 50^0C? (The molar heat capacities at constant pressure and at 27^0C for N_2, H_2 and NH_3 are 6.8, 6.77 and 8.86 calmol^{-1} deg^{-1} respectively.)   **(5)**

CHEM 119

SECTION – B

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

5. (a) Describe the limitations of Bohr's model of an atom. How did Sommerfeld modify the Bohr's model of atom? **(10+10=20)**

   (b) Calculate the wave number and wavelength of the spectral line observed in hydrogen spectrum with $n_1 = 2$ and $n_2 = 3$. The value of Rydberg's constant, $R=109.686\times10^{-6}\,m^{-1}$. **(5)**

   (c) What do you understand by the quantisation of angular momentum of an electron? Derive an expression for it, using wave nature of electron. **(10)**

6. (a) The N_2^+ molecule ion can be prepared by bombarding the N_2 molecule with fast moving electrons. What are their electron configuration and bond orders? Would you expect the bond length in N_2^+ to be shorter or longer than that in N_2? **(10)**

   (b) What is screening constant? How does it affect the value of ionisation potential of an element? **(2+8=10)**

   (c) Explain Transition state theory. Show that a first order reaction is never completed. **(15)**

7. (a) Arrange the following molecules in each series in the increasing order of their acidity with suitable explanation. **(7+7=14)**

   (i) HClO, $HClO_2$, $HClO_3$ and $HClO_4$

   (ii) CH_4, NH_3, H_2O and HF

   (b) Explain why on descending in the group IV A, the stability of +4 oxidation state decreases but +2 oxidation state increases. **(09)**

   (c) Discuss the types of hybridisation and geometrical shapes of PCl_5 and SF_6 molecules. **(6+6=12)**

8. (a) Describe the construction of lithium-ion battery. Write the reactions for charging and discharging of the battery. **(10)**

   (b) What is corrosion? Illustrate the mechanism of rusting. How corrosion can be prevented? The voltaic cell Cd(s) | Cd^{2+}(aq) || Ni^{2+}(1.0 M) | Ni(s) has a cell potential of 0.240 V at 25^0C. What is the concentration of cadmium ion? ($E^0_{cell} = 0.170$ V). **(10+8=18)**

   (c) How is pH of a solution determined by emf measurement? **(7)**

               Date : 25/09/2013

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2012-2013

Sub : **PHY 117** (Structure of Matter, Electricity and Magnetism and Modern Physics)

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) Obtain an expression for the fringe shift in Michelson-Morley experiment and explain each term in it. Calculate the fringe shift when D = 10 m, λ = 5000 Å and the earth speed v = 3×10^4 m/s, where the terms have their usual meaning. **(25)**

   (b) Two electrons emit from a radioactive sample in same direction, having speed of 0.5c (first electron) and 0.7c (second electron) with respect to the sample. What is the speed of first electron relative to the second electron? Explain the result. **(10)**

2. (a) Draw a figure to explain Compton Scattering? Show that the expression for the change in wavelength of a photon undergoing Compton Scattering is **(20)**

$$\lambda' - \lambda = \frac{h}{m_0 c}(1 - \cos\phi)$$

   where the terms have their usual meaning.

   (b) What are the failures of classical wave theory about photoelectric effect? **(8)**

   (c) An electron is accelerated through a potential difference of 300 V. Calculate the de Broglie wavelength of the electron. **(7)**

3. (a) Find the relation between mean life and radioactive decay constant of a radioactive substance. **(13)**

   (b) Why electron can't reside inside the nucleus? **(10)**

   (c) Estimate the age of earth from the relative abundance of the two isotopes of uranium, U^{235} and U^{238}. Given that half life of U^{235} = 7.07×10^8 years and half life of U^{238} = 4.5×10^9 years. **(12)**

4. (a) Define electric field strength. **(4)**

   (b) Sketch qualitatively the lines of forces associated with +3Q and –Q charges by considering as limiting cases points very close to the –Q charge and very far from it. **(6)**

   (c) A conducting circular ring of radius 'a' is charged uniformly around its circumferences. Find the electric field E on the axis of the ring at a distance x from the centre of the ring. What do you expect the value of electric field **(15)**

       (i) at x = 0? and

       (ii) x >> a?

   (d) What is Gaussian surface? Draw a Gaussian surface for an isolated point charge and find the electric field E at any point P on this surface at a distance r from the centre. Show that this value of electric field is the same as the electric field deduced from Coulomb's law for a point charge. **(10)**

PHY 117

SECTION – B

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

5. (a) Write down the four Maxwell's equations of electromagnetism. Explain the physical significance of them. **(10)**

(b) An electron is an electric monopole but magnetic dipole. Explain it. **(5)**

(c) State and explain Biot-Savart law. Figure 5(c) shows a current loop of radius R carrying a current I. Using Biot-Savart law find the value of magnetic field B at points **(20)**

       (i) At a distance x on the axis from the centre of the loop.

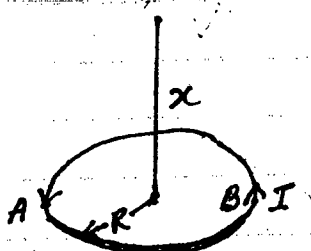   (ii) At the centre of the loop.

Fig. 5(c)

Sketch magnetic lines of force for this current carrying wire at point A and point B and between these two points (inside the loop) as shown in figure 5(c).

6. (a) What is capacitance of a capacitor? Define 1 farad. **(6)**

(b) A spherical capacitor consists of two concentric conducting sphere of radii a and b (b > a). Show that capacitance of this device is $4\pi \in_0 \dfrac{ab}{b-a}$. **(15)**

(c) The charge particles originated from solar wind are deflected by the earth's magnetic field and produce Aurora. Explain briefly about the "Aurora". **(10)**

(d) Give some examples of diamagnetic and paramagnetic materials. **(4)**

7. (a) What is difference between a crystal and a lattice, primitive cell and conventional cell? **(12)**

(b) Define Bravais lattice. Describe briefly the classification of Bravais lattices in 3D. **(13)**

(c) Calculate the packing fraction of bcc and fcc lattices. **(10)**

8. (a) What is a reciprocal lattice? Define Miller indices in the language of reciprocal lattice. **(10)**

(b) Discuss how Miller indices are derived. What is crystal direction? Show schematically [100], [112] and [111] direction in a SC lattice. **(15)**

(c) Show (100), (111) and (001) crystal planes of face centered cubic lattice with a clear diagram. **(10)**

Date : 27/07/2013

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2012-2013

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 – A

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

1. (a) How do you define human ecology and man-made environment?   (3⅓)

   (b) Define green house gases. How do you define environmental justice?   (10)

   (c) What are the socio-economic factors that influence population growth?   (10)

2. (a) What are the negative impacts of capitalism on society?   (7⅓)

   (b) Write down different evolutionary stages of city on the basis of Mumford's theory.   (8)

   (c) What is meant by human migration? Discuss Lee's theory of migration.   (8)

3. (a) What do you understand by social change? Discuss the characteristics of social change?   (10)

   (b) Briefly discuss the classification of cities with examples, according to urban sociologists.   (5⅓)

   (c) Define with examples, orange category A industry and orange category B industry.   (8)

4. Write short notes on any three of the following: (23⅓)

   (a) Globalization and modern life.

   (b) Demographic transition theory.

   (c) Consequences of global warming.

   (d) Consequences of industrial revolution.

SECTION – B

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

5. (a) Explain how sociologists think themselves away the familiar routines of daily lives through sociological imagination.   (10)

   (b) How do conflict viewers respond to the functionalist theoretical perspective of sociology?   (13⅓)

6. (a) How do you understand by absolute poverty and relative poverty?   (8⅓)

   (b) What is social stratification? Discuss different systems of social stratification in the context of Bangladesh.   (15)

HUM 211

7. (a) What do you understand by socialization? Do you think that family perpetuates the traditional gender roles of a society? Show arguments in favour of your answer. **(10)**

   (b) How does socialization shape human behaviour? Dicuss in the context of nature versus nature debate. **(13⅓)**

8. Write short notes on any three of the following: **(23⅓)**

   (a) Cultural lag.

   (b) Folkways and mores.

   (c) Dominant ideology.

   (d) Ethnocentrism.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2012-2013

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) Write down the steps for implementing "Activity Based Costing".   **(10)**

    (b) During Denton Company's first two years of operations, the company reported net operating income as follows (absorption costing basis):   **(25)**

	Year 1	Year 2
Sales (at $ 50 per unit)	$ 1,000,000	$ 1,500,000
Less cost of goods sold:		
Beginning inventory	0	170,000
Add cost of goods manufactured (at $ 34 per unit)	850,000	850,000
Goods available for sale	850,000	1,020,000
Less ending inventory (at $ 34 per unit)	170,000	0
Cost of goods sold	680,000	1,020,000
Gross margin	320,000	480,000
Less selling and administrative expenses	310,000	340,000
Net opening income	$ 10,000	$ 140,000

* $ 3 per unit variable: $ 250,000 fixed each year.

The company's $ 34 unit product cost is computed as follows:

Direct materials	$ 8
Direct labor	10
Variable manufacturing overhead	2
Fixed manufacturing overhead ($ 350,000 ÷ 25,000 units)	14
Unit product cost	$ 34

Production and cost data for the two years are given below:

	Year 1	Year 2
Units produced	25,000	25,000
Units sold	20,000	30,000

Required:

(i) Prepare an income statement for each year in the contribution format using variable costing.

(ii) Reconcile the absorption costing and variable costing net operating income figures for each year.

IPE 105

2. (a) What are the advantages of self imposed budget? **(10)**

(b) Silicon optics has supplied the following data for use in the activity-based costing system. **(25)**

Overhead Costs

Wages and salaries	$ 350,000
Other overhead costs	200,000
Total overhead costs	$ 550,000

Activity Cost Pool	Activity Measure	Total Activity
Volume	Number of direct labor-hours	10,000 DLHs
Order processing	Number of orders	500 orders
Customer support	Number of customers	100 customers
Other	These costs are not allocated to products or customers	Not applicable

Distribution of Resource Consumption
Across Activity Cost Pools

	Volume	Order Processing	Customer Support	Other	Total
Wages and salaries	30%	35%	25%	10%	100%
Other overhead costs	25%	15%	20%	40%	100%

During the year, Silicon Optics completed an order for a special optical switch for a new customer, Indus Telecom. This customer did not order any other products during the year. Data concerning that order follow:

Data Concerning the Indus Telecom Order

Selling price	$ 295 per unit
Units ordered	100 units
Direct materials	$ 264 per unit
Direct labor-hours	0.5 DLH per unit
Direct labor rate	$ 25 per DLH

Required:

(i) Prepare a report showing the first-stage allocations of overhead costs to the activity cost pools.

(ii) Compute the activity rates for the activity cost pools.

(iii) Prepare a report showing the overhead costs for the order from Indus Telecom.

(iv) Prepare a report showing the product margin for the order and the customer margin for Indus Telecom.

IPE 105

3. (a) Briefly discuss the comparative income effects of absorption and variable costing. **(10)**

(b) Topaz Company produces a single product. The company has set standards as follows for materials and labor. **(25)**

	Direct Materials	Direct Labor
Standard Quantity or hours per unit	? pounds	2.5 hours
Standard price or rate	? per pound	$ 9 per hour
Standard cost per unit	?	$ 22.50

During the past month, the company purchased 6,000 pounds of direct materials at a cost of $ 16,500. All of this material was used in the production of 1,400 units of product. Direct labor cost totaled $ 28,500 for the month. The following variances have been completed.

Materials Quantity variance	$ 1,200 U
Total materials variance	300 F
Labor efficiency variance	4,500 F

Required:

1. For direct materials:
   (i) Compute the standard price per pound for materials.
   (ii) Compute the standard quantity allowed for materials for the month's production.
   (iii) Compute the standard quantity of materials allowed per unit of product.
2. For direct labor:
   (i) Compute the actual direct labor cost per hour for the month.
   (ii) Compute the labor rate variance.

4. (a) What do you understand by throughput time and manufacturing cycle efficiency? **(10)**

(b) Crydon Inc. manufacturers an advanced swim fin for scuba divers. Management is new preparing detailed budgets for the third quarter, July through September, and has assembled the following information to assist in the budget preparation: **(25)**

(1) The Marketing Department has estimated sales as follows for the remainder of the year (in pairs of swim fins)

July	6,000	October	4,000
August	7,000	November	3,000
September	5,000	December	3,000

The selling price of the swim fins is $ 50 per pair.

(2) All sales are on account. Based on past experience, sales are expected to be collected in the following pattern:

    40% in the month of sale
    50% in the month following sale
    10% uncollectible

The beginning accounts receivable balance (excluding uncollectible amounts) on July 1 will be $ 130,000.

IPE 105

Contd ... Q. No. 4(b)

(3) The company maintains finished goods inventories equal to 10% of the following month's sales. The inventory of finished goods on July 1 will be 600 pairs.

(4) Each pair of swim fins required 2 pounds of geico compound. To prevent shortage, the company would like the inventory of geico compound on hand at the end of each month to be equal to 20% of the following month's production needs. The inventory of geico compound on hand on July 1 will be 2,440 pounds.

(5) Geico Compound costs $ 2.50 per pound. Crydon pays for 60% of its purchases in the month of purchase: the remainder is paid for in the following month. The accounts payable balance for geico compound purchases will be $ 11,400 on July 1.

Required:

(i) Prepare a sales budget, by month and in total, for the third quarter. (Show your budget in both pairs of swim fins and dollars). Also prepare a schedule of expected cash collections, by month and in total, for the third quarter.

(ii) Prepare a production budget for each of the months July through October.

(iii) Prepare a materials purchases budget for geico compound, by month and in total, for the third quarter. Also prepare a schedule of expected cash payments for geico compound, by month and in total, for the third quarter.

SECTION – B

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

5. Selected account balances for the year ended December 31 are provided below for Superior company.   **(35)**

Selling and Administrative Salaries	$ 110,000
Insurance, Factory	8,000
Utilities, Factory	45,000
Purchases of Raw Materials	290,000
Indirect labor	60,000
Direct labor	?
Advertising Expenses	80,000
Cleaning Supplies, Factory	7,000
Sales Commissions	50,000
Rent, Factory Building	120,000
Maintenance Factory	30,000

Inventory balance at the beginning and end of the year were as follows:

	Beginning	End
Raw Material	$ 40,000	$ 10,000
Work-in-Process	?	35,000
Finished Goods	50,000	?

IPE 105

Contd ... Q. No. 5

Total manufacturing costs for the year were $ 683,000; goods available for sale totaled $ 750,000; and cost of goods sold totaled $ 660,000.

(i) Prepare a schedule of cost of goods manufactured and cost of goods sold.

(ii) Assume that the dollar amounts given above are for the equivalent of 40,000 units produced during this year. Compute the unit cost of direct material.

(iii) Assume that in the following year, the company expected to produce 50,000 units. What per unit and total cost would you expect to be incurred for direct material?

(iv) Discuss the reasons behind the difference between the two units costs from (ii) and (iii).

6. Teledex company manufacturers products to customer's specifications and operates a job-order cost systems. Manufacturing overhead cost is applied to jobs on the basis of direct labor cost. The following estimates were made at the beginning of the year: **(35)**

	Department			
	Fabricating	Machining	Assembly	Total
Direct Labor	$ 200,000	$ 100,000	$ 300,000	$ 600,000
Manufacturing Overhead	350,000	400,000	90,000	840,000

Jobs require varying amounts of work in three departments. A particular customer's job, for example, would have required manufacturing costs in the three departments as follows:

	Department			
	Fabricating	Machining	Assembly	Total
Direct Labor	$ 2,800	$ 500	$ 6,200	$ 9,500
Direct Material	3,000	200	1,400	4,600
Manufacturing Overhead	?	?	?	?

The company uses a plant wide overhead rate to apply manufacturing overhead cost to jobs.

(a) Assuming use of a plant wide overhead rate:

(i) Compute the rate for the current year

(ii) Determine the amount of manufacturing overhead cost that would have been applied to the customer's job.

(b) Suppose that instead of using a plant wide overhead rate, the company used a separate predetermined overhead rate in each department: Under these conditions:

(i) Compute the rate for each department for the current year.

(ii) Determine the amount of manufacturing overhead cost that would have been applied to the customer's job.

(c) At the end of the year, the company assembled the following actual cost data relating to all jobs worked on during this year:

	Department			
	Fabricating	Machining	Assembly	Total
Direct Labor	$ 210,000	$ 108,000	$ 262,000	$ 580,000
Direct Material	190,000	16,000	114,000	320,000
Manufacturing Overhead	360,000	420,000	84,000	864,000

IPE 105

Contd ... Q. No. 6

Compute the under-applied or over-applied overhead for the year

    (i) assuming a plant wide overhead rate used

    (ii) assuming a departmental overhead rate used.

7. You are employed by a company that manufacturers digital watches. The company's chief financial officer is trying to verify the accuracy of the ending work in process and finished goods inventories prior to closing the books of the year. You have been asked to assist in this verification. The year-end balance shown on the company's books are as follows: **(35)**

	Units	Costs
Work in process, December 31 (50% complete as to labor and overhead)	300,000	$ 660,960
Finished goods, December 31	200,000	1,009,800

Materials are added to production at the beginning of the manufacturing process, and overhead is applied to each product at the rate of 60% of direct labor costs. There was no finished goods inventory at the beginning of the year. A review of the company's inventory and cost records has disclosed the following data:

	Units	Costs Material	Labor Costs
Work in process, January 1 (80% complete as to labor and material)	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		

(i) Determine the equivalent units and costs per equivalent unit for materials, labor and overhead for the year.

(ii) Determine the amount of costs that should be assigned to the ending work in process and finished goods inventories.

(iii) Determine the cost of goods sold for the year assuming there is no over-applied or under-applied overhead.

IPE 105

8. (a) A single product manufacturing company keeps careful records of its manufacturing activities from which the following information has been extracted: **(20)**

	Level of Activity	
	March-Low	June-High
Number of units produced	6,000	9,000
Cost of goods manufactured	$ 168,000	$ 257,000
WIP inventory, beginning	9,000	32,000
WIP inventory ending	15,000	21,000
Direct material cost per unit	6	6
Direct labor cost per unit	10	10
Manufacturing overhead cost, Total	?	?

The company's manufacturing costs consists of both variable and fixed cost elements. To have data available for planning, management wants to determine how much of the overhead cost is variable with units produced and how much of it is fixed per month.

(i) For both March and June, determine the amount of manufacturing overhead cost added to production (no under or over-applied overhead in either month).

(ii) Using high-low method of cost analysis, estimate a cost formula for manufacturing overhead. Express the variable portion of the formula in terms of a variable rate per unit of products.

(iii) If 7000 unit are produced during a month, what would be the cost of goods manufactured?

(b) A company manufacturers and sells telephone answering machine. The company's contribution format income statement for the most recent year is given below: **(15)**

	Total	Per Unit	Percent of Sales
Sales (20,000 units)	$ 1,200,000	$ 860	100%
Less variable expenses	900,000	45	?%
Contribution margin	300,000	815	?%
Less fixed expenses	240,000		
Net income	$ 60,000		

Management is anxious to improve the company's profit performance and has asked for several items of information:

(i) Compute the company's CM ratio and variable expense ratio.

(ii) Compute the company's break-even point in both units and sales dollars (use equation method).

(iii) Assume that sales increase by $ 400,000 next year. If cost behaviour pattern remain unchanged, by how much will the company's net income increase (use CM ratio).

(iv) Assume next year the company wants to earn a minimum profit of $ 90,000. How many units will have to be sold?