L-2/T-2/MME **Date : 01/07/2015**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2013-2014

Sub : **EEE 267** (Electrical and Electrical Technology)

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**.

(Assume any reasonable value if required)

1. (a) What is meant by 'voltage regulation'? Explain with necessary phasor diagram(s), why voltage regulation is positive for lagging loads and negative for capacitive loads. **(7)**

(b) The following test data are obtained from open-circuit and short-circuit tests of a 25 kVA, 6900-230V, 60Hz, single phase, step-down transformer: **(18)**

$V_{oc} = 230$ V	$V_{sc} = 513$ V
$I_{oc} = 5.4$ A	$I_{sc} = 3.62$ A
$P_{oc} = 260$ W	$P_{sc} = 465$ W

(i) On which side the tests have been performed?

(ii) Find all the transformer model parameters using test data.

(iii) Calculate voltage regulation and efficiency, when the primary side is energized with a 6888 V ac source and a load impedance of $2 + j\ 0.5\ \Omega$ is connected to the secondary side.

(iv) How much current will flow through the transformer windings if the load impedance mentioned in part-iii gets accidentally shorted?

(c) A 150 kVA, 9600-800V, 60 Hz, single-phase transformer is operating in the step-down mode. The combined core loss of the transformer is 500 W and the magnetizing current is 2.5 percent of the rated primary current. Determine- **(10)**

(i) exciting current and its components

(ii) no-load power factor

(iii) input apparent power and input reactive power at no-load.

(iv) value of core loss, if the transformer is made to operate in the step-up mode.

2. (a) What is an infinite bus? Why must the oncoming generating have a higher frequency compared to the running system to operate in parallel? Write down the other conditions need to be met for paralleling generators? **(8)**

(b) In a small town, there are two generators operating in parallel. During peak hours, the total demand is 425 kW and it drops to 300 kW in off-peak hours. Generator-1 is a six-pole machine and deliver a maximum of 200 kW. Generator-2 is a two-pole machine and has a maximum capacity of 300 kW.

Contd P/2

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Contd ... Q. No. 2(b)

The prime mover of generator-1 has a no-load speed of 1030 rpm and a full-load speed of 990 rpm. The prime mover of generator-2 has a no-load of 3060 rpm and a full load speed of 2940 rpm. **(20)**

(i) Determine the system frequency during off-peak hours and the power supplied by each generator

(ii) Determine the system frequency during peak hours.

(iii) What needs to be done to maintain the system frequency at its off-peak value throughout the day? Explain with house diagram.

(c) What is commutation? How can a commutator convert ac voltages on a machine's armature to dc voltages at its terminals? **(7)**

3. (a) Show that, a balanced three-phase set of currents flowing through a three-phase winding produces a rotating magnetic field of constant magnitude. How can the direction of rotation of the magnetic field be reversed? **(15)**

(b) Draw the torque-speed characteristic of a synchronous motor. What will happen if the torque on the shaft exceeds the pullout torque? **(5)**

(c) A 480 V, 100 kW, 50 Hz, four pole, Y-connected synchronous motor has a rated power factor of 0.8 leading. All full load, the efficiency is 90 percent. The armature resistance is 0.1 Ω and the synchronous reactance is 1.0 Ω. Find the following quantities for this machine when it is operating at full load: **(15)**

(i) Shaft speed
(ii) Output torque
(iii) Input power
(iv) I_A and E_A
(v) P_{conv}
(vi) $P_{mech} + P_{core} + P_{stray}$

4. (a) What are the basic differences between a synchronous motor and an induction motor. **(5)**

(b) Prove that, maximum induced torque in an induction motor is independent of rotor resistance. **(15)**

(c) A 3-phase, Δ-connected, 25 hp, 600 V, 4 pole induction motor is drawing a line current of 27 A. The torque-speed characteristic shown below is plotted for a rotor resistance (referred to the stator side) of 2.52 Ω. Using graph, determine the following: **(15)**

(i) Synchronous speed
(ii) Starting torque
(iii) Breakdown torque
(iv) Slip at which breakdown torque occurs

If the rotor resistance is now reduced by 50%, what will be the new value of starting torque and breakdown torque?

Contd P/3

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SECTION – B

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

(All the symbols and notations used in this part have their usual meanings.)

5. (a) For the following circuit, input voltage at the primary side is sinusoid with 240 V peak. If the required peak voltage at the rectifier output is 12 V, determine the turns ratio of the transformer. Show all work. (Assume that the diodes are ideal and $R_L = 3R$). **(20)**

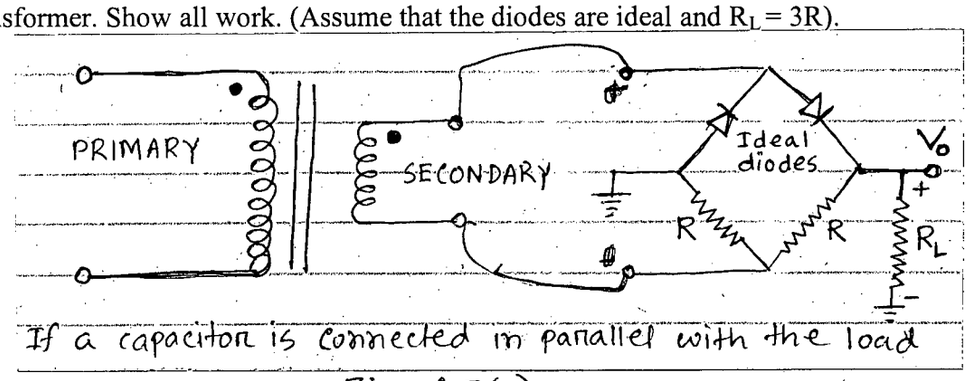

Fig. Q5(a)

If a capacitor is connected in parallel with the load resistor, how will the output voltage change? Explain.

(b) For the following circuit, determine the range of input voltage that will keep the Zener diode in the 'ON' state. (V = 9 V, I_{ZM} = 20 mA) **(15)**

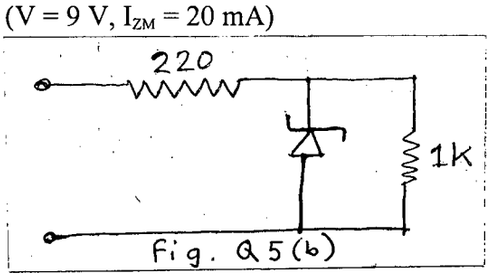

Fig. Q5(b)

6. (a)

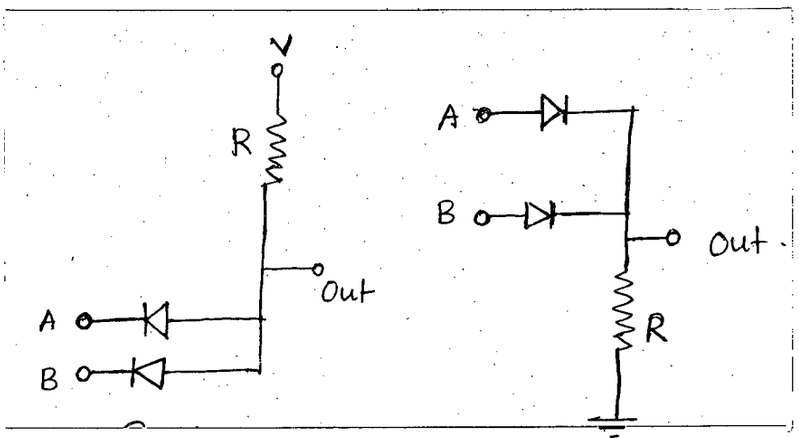

Fig. Q6(a)

In the above circuit, inputs A and B can have only binary level values, logic "1" (5 V) or logic "0" (0 v). Find the value of output voltage for all possible input combinations. Which logic functions are being implemented by these two circuits? **(8)**

(b) Draw the transfer characteristics of a n-p-n transistor operating in common emitter configuration. Explain how this transistor can be operated as a switch and an amplification. **(12)**

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Contd ... Q. No. 6

(c) For the circuit shown below, determine: **(15)**

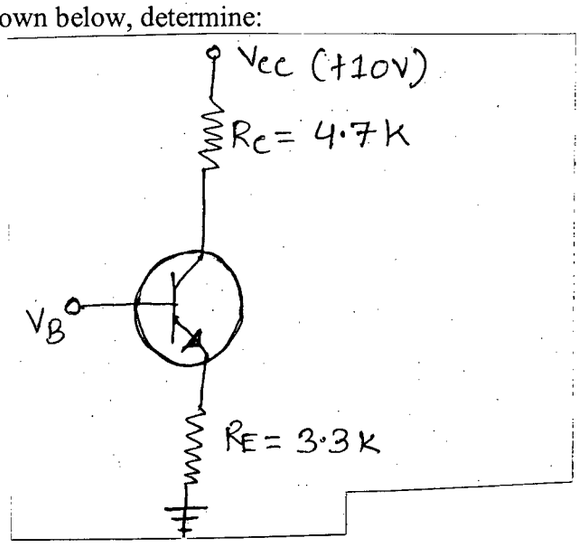

Fig. Q 6 (c)

(i) the highest voltage to which the base can be raised while transistor operates in the active mode.

(ii) the base voltage at which the transistor Q point will lie at the middle of cut off and saturation.

7. (a) For the following circuit, find the expression of output voltage in terms of V_1, V_2 and V_3. If $V_2 = -2V$ and $V_3 = 3V$ and V_1 is a triangular wave as shown in the figure, sketch the current through the R_L. **(20)**

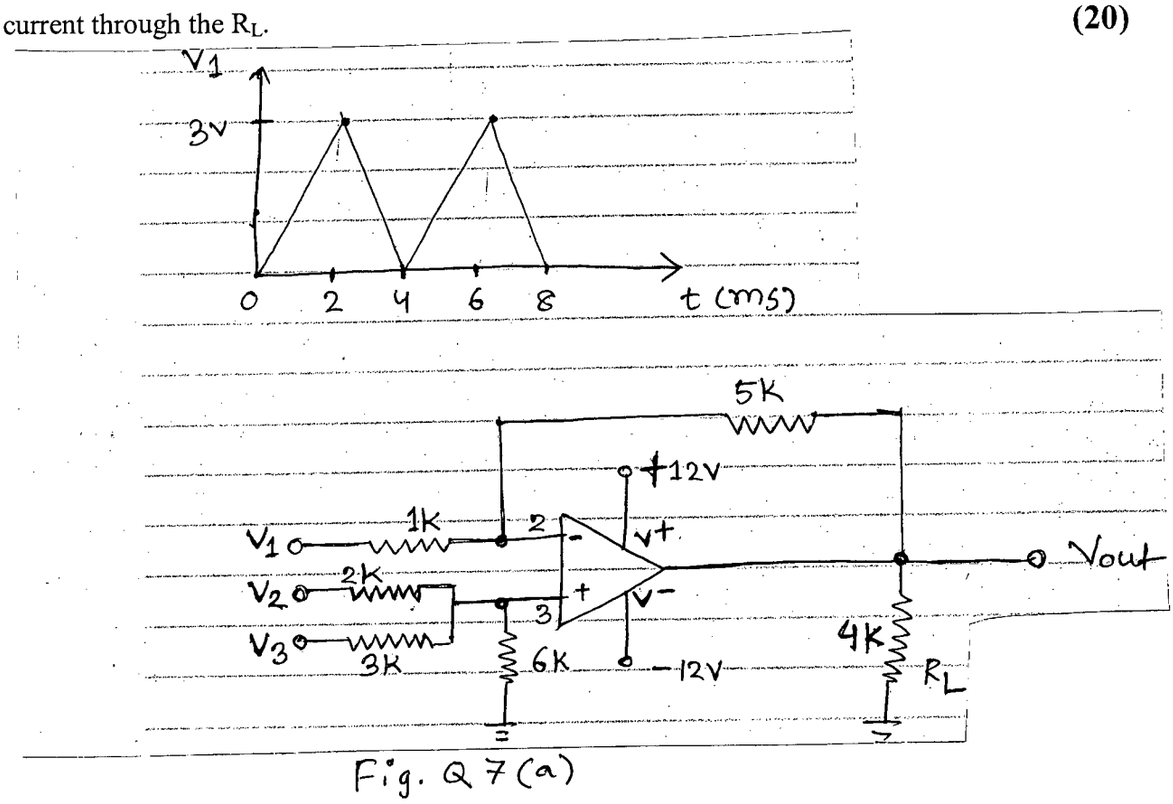

Fig. Q 7 (a)

(b) Design a circuit using Op-Amps that will implement the following function: **(15)**

$$V_{out}(t) = 3\frac{d^2 v_1}{dt^2} - \frac{2dv_2}{dt}$$

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8. (a) For the Y-Δ system shown in the figure, $Z_\Delta = 15 + j12\ \Omega$, $Z_l = 5 - j2\ \Omega$ **(15)**

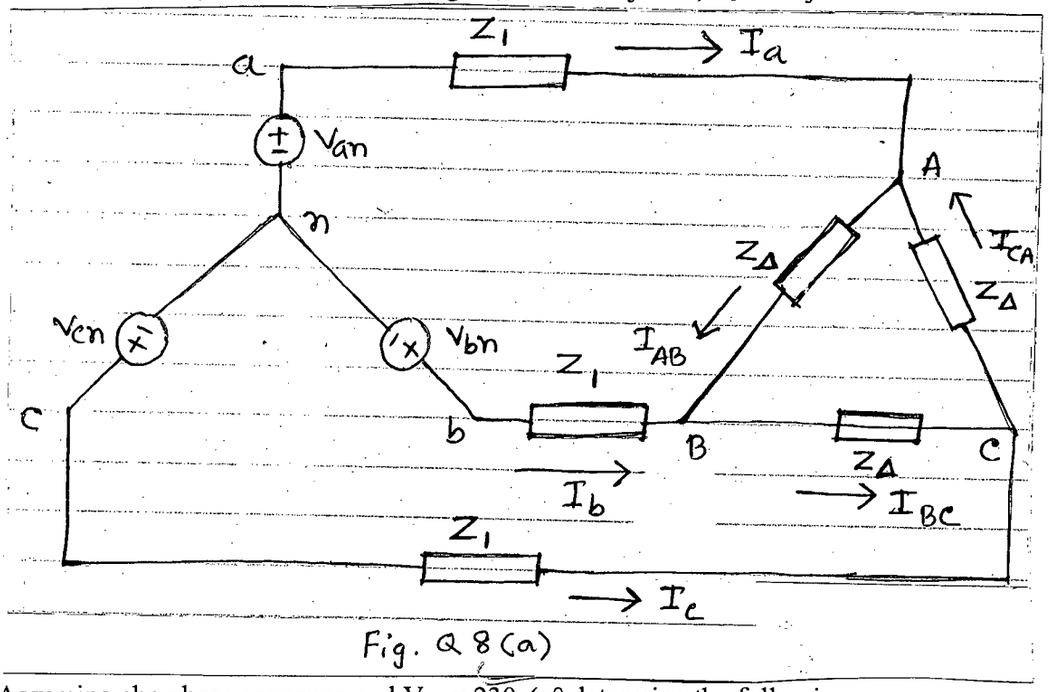

Fig. Q 8 (a)

Assuming abc phase sequence and $V_{bn} = 230\angle 0°$ determine the following-

(i) line voltage at the sending end V_{ab}, V_{bc}, V_{ca}.

(ii) line voltage at the receiving end V_{AB}, V_{BC}, V_{CA}

(iii) line current I_a, I_b, I_c

(iv) Phase current I_{AB}, I_{BC}, I_{CA}.

(v) total power loss in the transmission line.

(b) The balanced loads are connected to a three-phase, 11 kV (rms), 50 Hz line. Load-1 is a 3-phase induction motor drawing 40 kVA at 0.8 pf lagging, where as load-2 is a 3 phase synchronous motor drawing 5 kVA at 0.6 pf leading.

(i) Find the power factor of the combined load.

(ii) Find the line current.

(iii) To improve the power factor to 0.95 lagging, A Δ-connected capacitor bank is to be connected in parallel with the existing load. Fin the value of each capacitor to accomplish this power factor connection.

(iv) The line current after the capacitor bank installed.

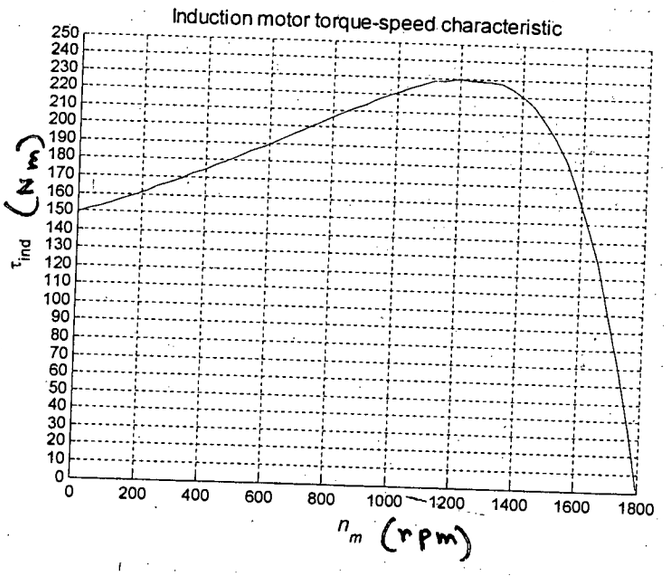

Fig for Q. No. 4 (c)

L-2/T-2/MME **Date : 02/08/2015**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2013-2014

Sub : **MME 235** (Heat and Mass Transfer)

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**.

Figure for view factor and Table for blackbody radiation functions included. Assume any missing data.

1. (a) Derive the expressions for average heat and mass transfer coefficients for a fluid flowing over a surface. **(14)**

(b) Air at 350 k flows at a velocity $u_\infty = 21$ m/s over a flat plate of length L = 1 m. In the laminar and turbulent regions, experimental measurements show that the local convection heat transfer coefficients are, respectively, **(16)**

$h_{lam}(x) = C_{lam}\, x^{-0.5}$ and $h_{turb}(x) = C_{turb}\, x^{-0.2}$

where x has units of m.

At 350 k,

$C_{lam} = 8.845$ W/m$^{1.5}$. k and

$C_{turb} = 49.75$ W/m$^{1.8}$. k

Determine the average convection heat transfer coefficient over the entire plate Given: Critical Reynolds number, $Re_{x,c} = 5 \times 10^5$ Air (at T = 350 k) k = 0.03 W/m.k, $\nu = 20.92 \times 10^6$ m^2/s.

(c) It is observed that a 230-mm-diameter pan of water at 23°C has a mass loss rate of 1.5×10^{-5} kg/s when the ambient air is dry and at 23°C. Determine the convection mass transfer coefficient for this situation. Given: **(5)**

Density of saturated water vapor at 296 k, $\rho_{w,sat} = 0.0202$ kg/m^3.

2. (a) Derive an expression for the log mean temperature difference (LMRD) for a counter flow heat exchanger. **(17)**

(b) A counter flow, concentric tube heat exchanger comprising of a thin-walled inner tube of diameter 25 mm and an outer tube of diameter 45 mm is shown in Fig. 1. Engine oil is to be cooled from 100 to 60°C. Cooling water enters the inner tube at 30°C and flows at a rate of 0.1 kg/s. Oil flows through the annulas at the same rate of 0.1 kg/s. The heat transfer coefficients at the water side and oil side of the inner tube are 1860 and 62 W/m^2. k respectively. **(18)**

(i) Determine the total heat transfer and the outlet temperature of the water.

(ii) Determine the length required for the heat exchanger.

Given: Specific heat of water, $c_{p,w} = 4200$ J/kg-k; Specific heat of oil, $c_{p,o} = 1900$ J/kg-k

Contd P/2

MME 235

3. (a) The spectral hemispherical emissivity of fire brick wall at 750 k as a function of wavelength is approximated in stepwise variation as follows:

$\varepsilon_\lambda = 0.1$ for $0 \leq \lambda \leq 2$ μm

$\varepsilon_\lambda = 0.6$ for 2 μm $\leq \lambda \leq 14$ μm

$\varepsilon_\lambda = 0.8$ for 14 μm $< \lambda < \infty$

Determine the total hemispherical emissivity and emissive power of the fire brick wall at 750 k. The value of $\sigma = 5.67 \times 10^{-8}$ W/m^2.k^4. **(15)**

(b) Radiation leaves a furnace of inside surface temperature 1500 k through an aperture 20 mm in diameter. A portion of the radiation is intercepted by a detector that is 1 m from the aperture, has a surface area of 10^{-5} m^2, and is oriented as shown in Fig. 2. **(20)**

(i) If the aperture is open, what is the rate at which radiation leaving the furnace is intercepted by the detector?

(ii) If the aperture is covered with a diffuse, semitransparent material of spectral transmissivity $\tau_\lambda = 0.8$ for $\lambda \leq 2$ μm and $\tau_\lambda = 0$ for $\lambda > 2$ μm, what is the rate at which radiation leaving the furnace is intercepted by the detector?

4. (a) Determine the view factor, F_{12}, for the perpendicular rectangles without a common edge as shown in Fig. 3. **(17)**

(b) Consider a long equilateral-triangle-shaped duct constructed with diffuse, gray walls 1 m wide as shown in Fig. 4. The surface conditions are given below: **(18)**

Surface	Surface conditions
A_1	$T_1 = 1000$ k, $\varepsilon_1 = 0.33$
A_2	$T_2 = 700$ k, $\varepsilon_2 = 0.50$
A_R (insulated)	$\varepsilon_R = 0.80$

(i) Sketch the radiation network.

(ii) Determine the net radiation transfer from surface A_1 per unit length of the duct.

(iii) Determine the temperature, T_R of the insulated surface A_R.

SECTION – B

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

5. (a) Beginning with a differential control volume in the form of a cylindrical shell, derive the heat diffusion equation for a one-dimensional, cylindrical, radial coordinate system with internal heat generation. **(18)**

(b) Consider a plane wall to thickness $2L$. The surface at $x = L$ is subjected to convective conditions characterized by $T_{\infty,1}$, h_1, while the surface at $x = L$ is subjected to conditions $T_{\infty,2}$, h_2. The initial temperature of the wall is T_o $(T_{\infty,1}\ h_1 + T_{\infty,2},\ h_2)/2$ where $T_{\infty,1} > h_{\infty,2}$. Write the one dimensional differential equation, and identify the boundary and initial conditions that could be used to determine the temperature distribution $T(x, t)$ as a function of positive and time. **(17)**

Contd P/3

MME 235

6. (a) A very long rod 5 mm in diameter has one end maintained at 100°C. The surface of the rod is exposed to ambient air at 25°C with a convection heat transfer coefficient of 100 W/m^2.K. Determine the temperature distributions along rods constructed from 2024 aluminum alloy and type AISI 316 stainless steel. What are the corresponding heat losses from the rods? For 2024 aluminum at 335K : k = 180 W/m.K. For stainless steel, AISI 316 at 335K : k = 14 W/m.K. **(18)**

   (b) A thin silicon chip and an 8-mm-thick aluminum substrate are separated by a 0.02-mm thick epoxy joint. The chip and substrate are each 10 mm on a side, and their exposed surfaces are cooled by air, which is at a temperature of 25°C and provides a convection coefficient of 100 W/m^2.K. If the chip dissipates 10^4 W/m^2 under normal conditions, will it operate below a maximum allowable temperature of 85°C? **(17)**

   For pure aluminum ($T \sim 350$ K): k = 239 W/m.K. For silicon chip/aluminum with 0.02-mm

   Epoxy interface $R''_{t,c} = 0.9 \times 10^4$ W/m.K.

7. (a) Using the energy balance method, derive the finite-difference equation for the (m, n) nodal point located on a plane as shown in Figure 5. The point is located on insulated surface of a medium with uniform heat generation. **(17)**

   (b) An uninsulated steam pipe passes through a room in which the air and walls are at 25°C. The outside diameter of the pipe is 70 mm, and its surface temperature and emissivity are 200°C and 0.8, respectively. What are the surface emissive power and irradiation? If the coefficient associated with free convection heat transfer from the surface to the air is 15 W/m^2.K, what is the rate of heat loss from the surface per unit length of pipe? **(18)**

8. (a) Derive the explicit finite-difference equation for an interior node for Two-dimensional transient conduction. Also determine the stability criterion. Assume constant properties and equal grid spacing in both directions. **(18)**

   (b) A thermocouple junction, which may be approximated as a sphere, is to be used for temperature measurement in a gas stream. The convection coefficient between the junction surface and the gas is h = 400 W/m^2.K, and the junction thermophysical properties are k = 20 W/m.K, c = 400 J/kg . K, and ρ = 8500 kg/m^3. Determine the junction diameter needed for the thermocouple to have a time constant of 1 s. If the junction is at 25°C and is placed in a gas stream that is at 200°C, how long will it take for the junction to reach 199°C? **(17)**

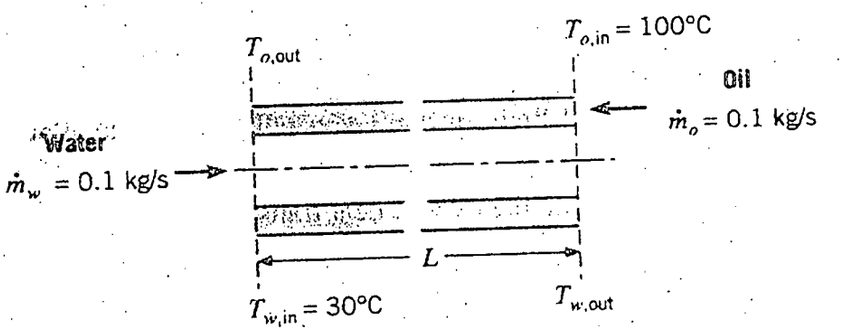

Fig. 1 for Q. No. 2 (b)

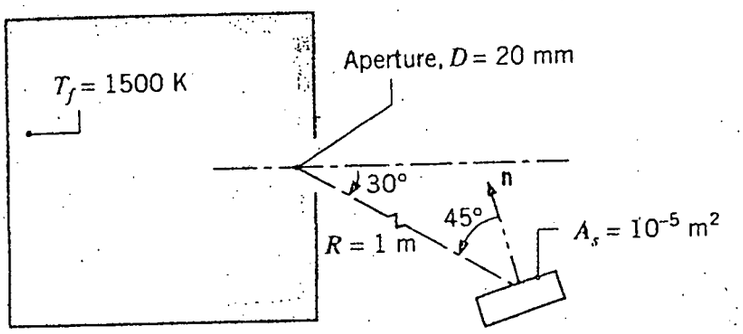

Fig. 2 for Q. No. 3(b)

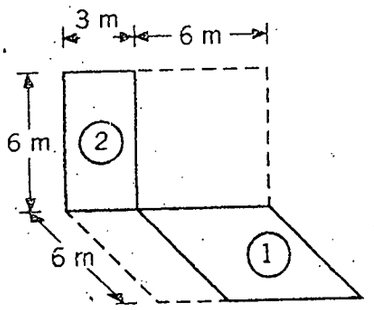

Fig. 3 for Q. No. 4(a)

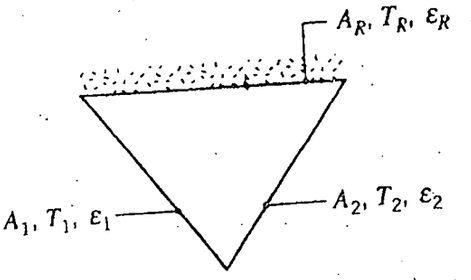

Fig. 4 for Q. NO. 4(b)

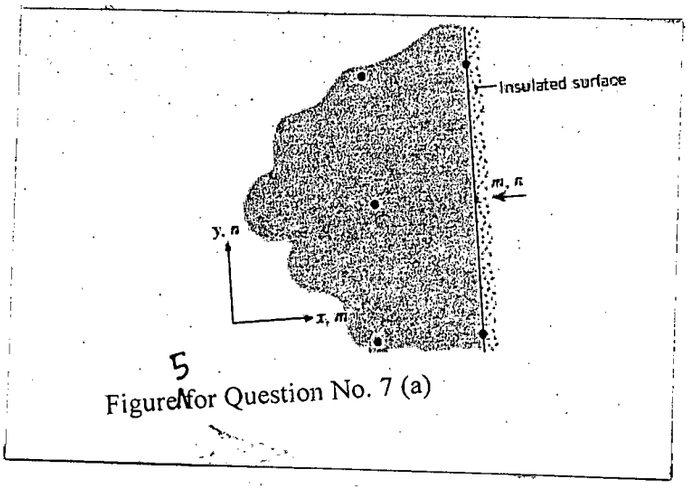

Figure for Question No. 7 (a)

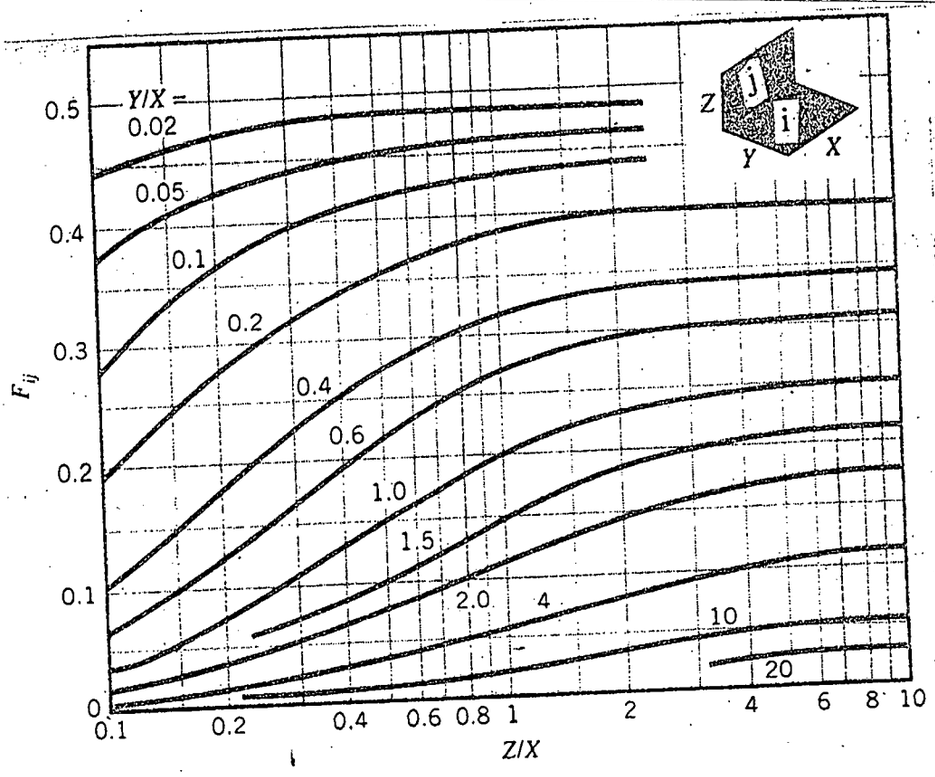

FIGURE 4-26 View factor for perpendicular rectangles with a common edge.

Table for blackbody radiation functions

λT (μm · K)	$F_{(0\to\lambda)}$	λT (μm · K)	$F_{(0\to\lambda)}$
200	0.000000	7,000	0.808109
400	0.000000	7,200	0.819217
600	0.000000	7,400	0.829527
800	0.000016	7,600	0.839102
1,000	0.000321	7,800	0.848005
1,200	0.002134	8,000	0.856288
1,400	0.007790	8,500	0.874608
1,600	0.019718	9,000	0.890029
1,800	0.039341	9,500	0.903085
2,000	0.066728	10,000	0.914199
2,200	0.100888	10,500	0.923710
2,400	0.140256	11,000	0.931890
2,600	0.183120	11,500	0.939959
2,800	0.227897	12,000	0.945098
2,898	0.250108	13,000	0.955139
3,000	0.273232	14,000	0.962898
3,200	0.318102	15,000	0.969981
3,400	0.361735	16,000	0.973814
3,600	0.403607	18,000	0.980860
3,800	0.443382	20,000	0.985602
4,000	0.480877	25,000	0.992215
4,200	0.516014	30,000	0.995340
4,400	0.548796	40,000	0.997967
4,600	0.579280	50,000	0.998953
4,800	0.607559	75,000	0.999713
5,000	0.633747	100,000	0.999905
5,200	0.658970		
5,400	0.680360		
5,600	0.701046		
5,800	0.720158		
6,000	0.737818		
6,200	0.754140		
6,400	0.769234		
6,600	0.783199		
6,800	0.796129		

L-2/T-2/MME **Date : 06/08/2015**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2013-2014

Sub : **ME 221** (Elements of Fluid Mechanics and Machinery)

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) What is minor loss? Where and how does it occur? **(7)**

   (b) Find an expression for the minor loss due to a sudden expansion in a pipe in terms of V_1 and the area ratio (see figure Q1(b)). Assume uniform velocity profiles and that the pressure at the sudden enlargement is p_1. What is the loss coefficient if $A_2 >> A_1$? **(13)**

   (c) The flow rate is measured to be 0.006 m^3/s in the pipe shown in figure Q1(c). Find the loss coefficient of the valve if $H = 4$ cm. **(15)**

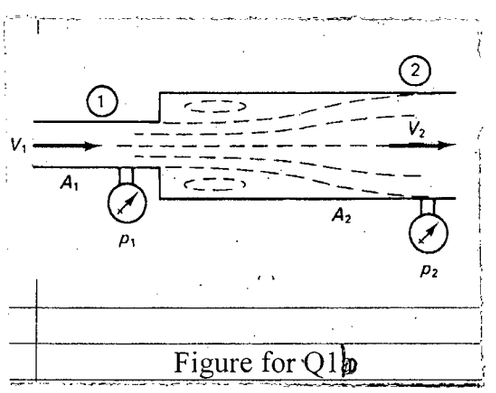

Figure for Q1(b)

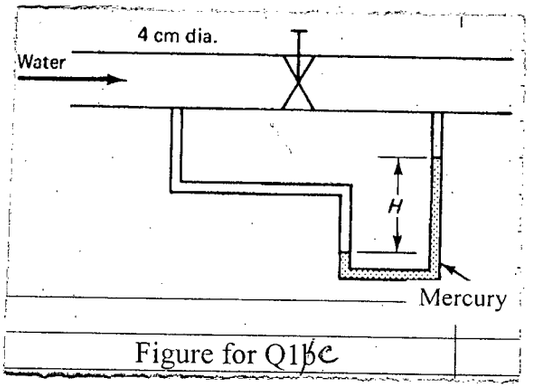

Figure for Q1(c)

2. (a) Find the velocity V_1 of the water in the vertical pipe. Assume no losses. **(15)**

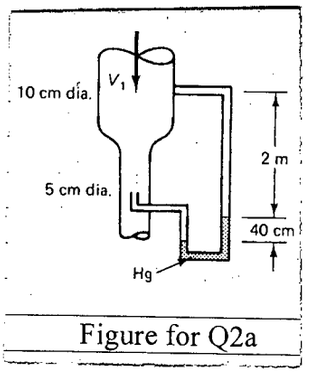

Figure for Q2a

   (b) A laminar flow is to exist in a pipe transporting 0.004 m^3/s of water at 20°C. What is the maximum allowable diameter? What is the friction factor and the pressure drop over 10 m of horizontal pipe for this diameter? **(15)**

   (c) What is cavitation? Why is it undesirable in a fluid flow? **(5)**

Contd P/2

ME 221(MME)

3. (a) What is open channel flow? Give two examples. **(4)**

(b) Starting from the Chezy-Manning equation, show that the water will flow most efficiently if the width of a rectangular channel is twice the depth of the flowing water. **(16)**

(c) Calculate the flow rate in a 2-m wide rectangular, planed wood channel on a slope of 0.001 if the depth is 60 cm. Use Chezy-Manning equation. Take Manning n = 0.012. **(15)**

4. (a) Compare the salient features of positive displacement and dynamic pumps. **(8)**

(b) A pressure drop of 500 kPa is not to be exceeded over a 200-m length of horizontal, 10-cm-diameter cast iron pipe. Calculate the maximum flow rate if the fluid is water at 20°C. Attach with your answer script the Moody diagram marking the friction factor appropriate for this flow. **(22)**

(c) Sketch the typical performance curves of a centrifugal pump. **(5)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.
Assume reasonable value for missing data.

5. (a) Briefly discuss the following fluid properties- **(10)**

(i) Viscosity

(ii) Compressibility

(iii) Vapor pressure

(b) Show that the internal pressure in a bubble is twice as large as that in a droplet of the same size. **(10)**

(c) An oil film of viscosity μ and thickness $h(h << R)$ lies between a solid wall and a circular disk. The disk is rotated steadily at an angular velocity of ω as shown in Fig. for Q. 5(c). Derive the formulas for torque and corresponding power which will be required to rotate the disk. Neglect air drag. **(15)**

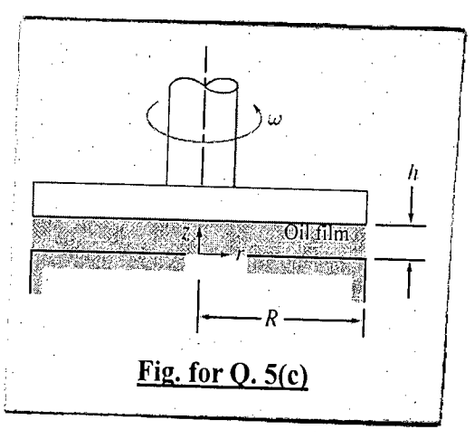

Fig. for Q. 5(c)

Contd P/3

ME 221(MME)

6. (a) Show that the fluid pressure at rest varies only in vertical direction and can be expressed by the following form- **(10)**

$$\frac{dp}{dz} = -\gamma$$

where the symbols have their usual meaning.

(b) Determine the absolute pressure in drum A at position a as shown in Fig. for Q. 6(b). **(15)**

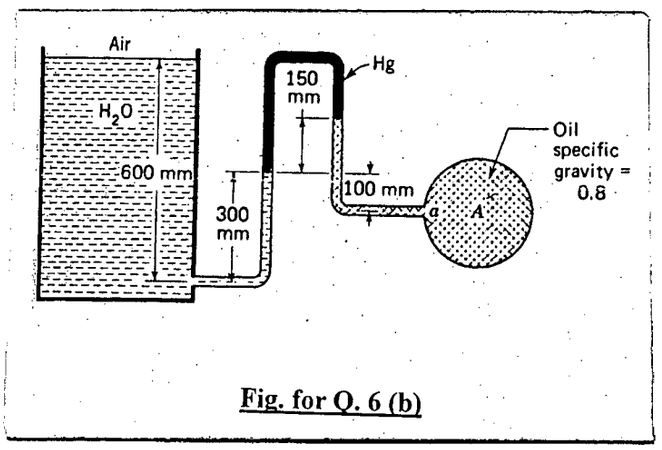

Fig. for Q. 6 (b)

(c) A rectangular container of water undergoes constant acceleration down an incline as shown in Fig. for Q. 6(c). Determine the slope of the free surface using the coordinate system shown. Is the slope remaining the same if the container moves upward instead of down? **(10)**

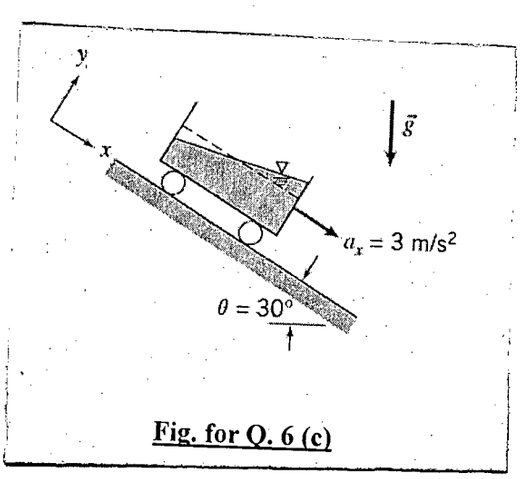

Fig. for Q. 6 (c)

7. (a) What do you mean by hydrostatic force? Mention some engineering applications of hydrostatic force. Consider a plane surface immersed in a liquid at an angle θ with the free-surface. Show that the center of pressure (CP) is always below the center of gravity (CG) of that plane surface except at $\theta = 90°$. **(20)**

(b) The gate as shown in Fig. for Q. 7(b) is hinged at *H*. The gate is 4 m wide normal to the plane of the diagram. Calculate the force required at A to hold the gate closed. **(12)**

ME 221(MME)

Contd ... Q. No. 7(b)

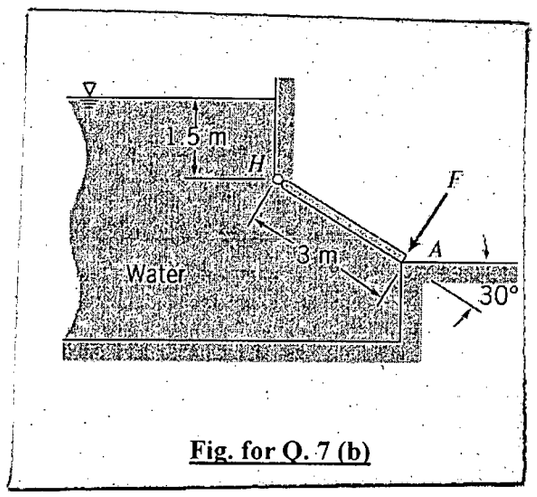

Fig. for Q. 7 (b)

8. (a) What do you understand by "neutrally stable" condition of a submerged body? A 0.25-m-diameter cylinder is 0.25 long and composed of material with sp. gravity of 0.8. Will the cylinder float in water with the ends horizontal? **(15)**

(b) Mention the names of 5 different flow meters which are used in industrial applications. Derive the expression of actual flow rate through an orifice meter. **(20)**

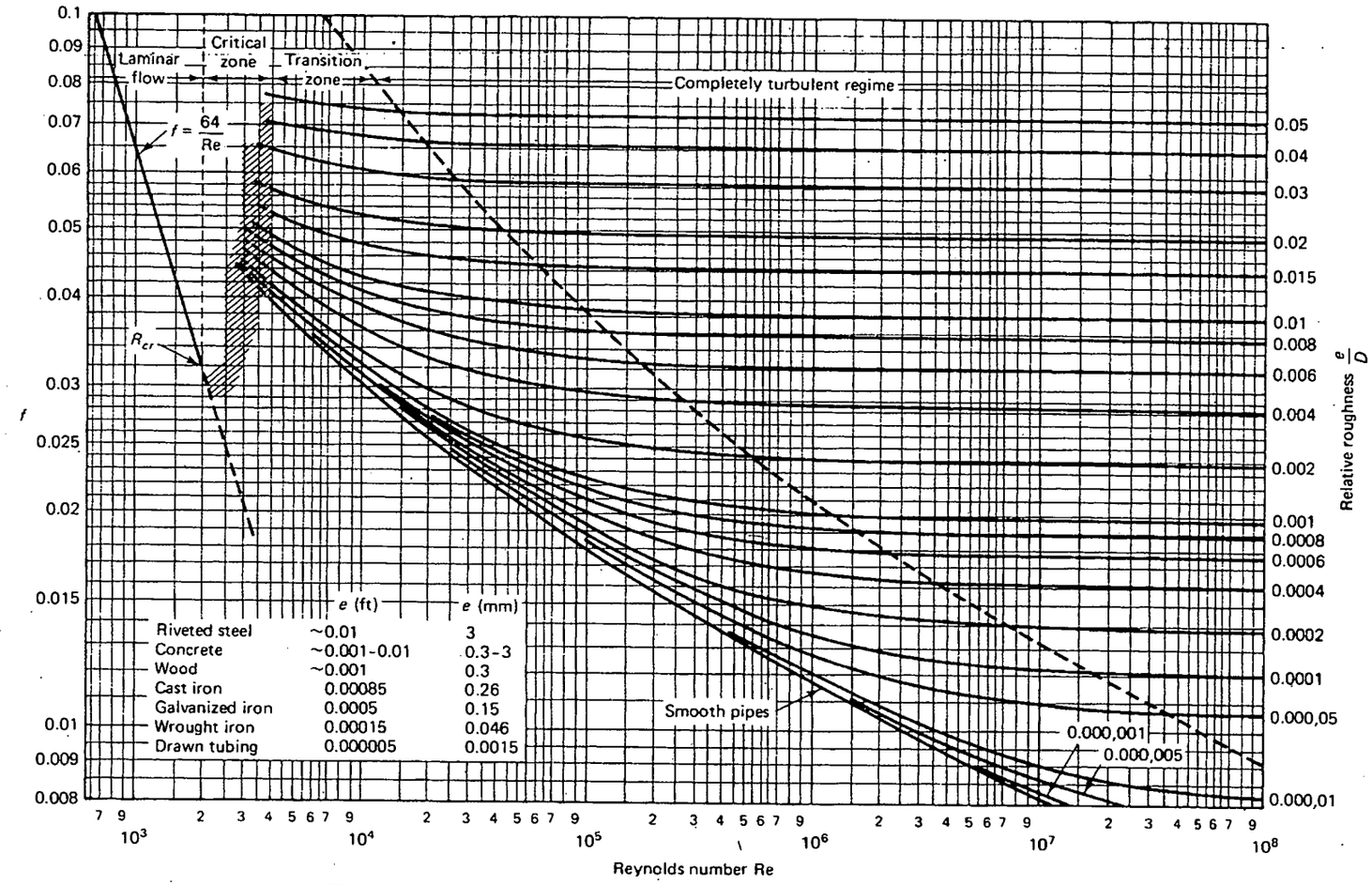

Figure 7.13 Moody diagram. (From L. F. Moody, *Trans. ASME*, Vol. 66, 1944.)

L-2/T-2/MME **Date : 10/08/2015**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2013-2014

Sub : **HUM 303** (Principles of 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) What is meant by the term operating Leverage? How is it useful in planning business operations? **(3)**

(b) The degree of operating leverage for 'X' company is 5 times where as it is 7 times for 'z' company. What does it imply? **(4)**

(c) Bogside Farm and Sterling Farm are two blueberry farms. Bogside Farm has higher variable cost as it depends on migrant workers to pick its berries by hand, where as Sterling Farm has higher fixed cost as a result of its investment in expensive machine to pick its berries. Following are the income statements of these two bluberry farms: **(28)**

Income Statement

	Bogside Farm	Sterling Farm
Sales	Tk. 100,000	Tk. 100,000
Less: Variable costs	60,000	30,000
Contribution	40,000	70,000
Less: Fixed costs	30,000	60,000
Net profit	10,000	10,000

Requirement:

(i) Considering CM ratio, break-even point and margin of safety expression, determine which company will earn greater profit in condition of high demand of the product and low demand of the product.

(ii) With calculations show which farm will earn grater profit under the condition of 10% increase in sales and 10% decrease in sales.

2. (a) In what situation, absorption costing will result higher net income than variable costing? Why? **(5)**

(b) For the income year ended on December 31, 2014; You have been given the information below: **(30)**

Selling price per unit	Tk. 50
Manufacturing cost:	
Direct material cost per unit	8
Direct labour cost per unit	7
Variable manufacturing overhead	5
Fixed manufacturing cost for the period in total	100,000
Selling and Administrative costs	
Variable cost per unit	2
Fixed cost for the period in total	80,000

Contd P/2

HUM 303(MME)

Contd ... Q. No. 2(b)

During the year, a total of 10,000 units produced but onley 8500 units sold.

Requirements:

(i) Determine the unit product cost under absorption costing and variable costing techniques.

(ii) Prepare income statement under both the techniques.

3. (a) What do you understand by mixed cost and cost formula? **(4)**

(b) Distinguish among manufacturing overhead, administrative overhead and selling and distribution overhead with examples. **(6)**

(c) The data below have been taken from the cost records of Frankel Company, a parcel service firm: **(20)**

If a delivery truck is driven 120,000 miles during a year, the average operating cost is Tk. 11.6 per mile. If a truck is driven only 80,000 miles during a year, the average operating cost increases to Tk. 13.6 per miles.

Requirements:

(i) Using the high-low point method, determine the variable cost per mile driven and the total fixed operating cost per year.

(ii) Express the variable and fixed costs in the form Y = a + bX

(iii) If a truck is driven 100,000 miles during a year, what total operating cost would you expect to be incurred?

(iv) What is the major disadvantages of high-low point method?

(d) Neptune Rentals offers a boat rental service. Consider the following costs of the company over a relevant range of 5000 to 20,000 hours of operating time for its boats. **(5)**

Hours of Operating Time

	5000	10,000	15,000	20,000
Total Costs (Tk.)				
Variable costs	20,000	?	?	?
Fixed Costs	180,000	?	?	?
Total	200,000	?	?	?
Cost per hour (Tk.)				
Variable costs	?	?	?	?
Fixed costs	?	?	?	?
	?	?	?	?

Requirements:

Compute the missing amounts, assuming that implied cost behavior patterns remain unchanged over the relevant range of 5000 to 20,000 hours.

4. (a) Listed below are a number of costs typically found in organizations. Classify them as variable, mixed or fixed cost: **(12)**

Contd P/3

HUM 303(MME)

Contd ... Q. No. 4(a)

(i) Hamburger buns in Wendy's outlet;

(ii) Advertising by a dental office;

(iii) Apples processed and canned by Del Monte;

(iv) Boxes used for packing detergent produced by the company;

(v) Wages of workers assembling computers;

(vi) Microchips used in producing calculators;

(vii) Thread used in a garment factory;

(viii) Sugar used in soft-drink production.

(b) Various costs data for Stratford Company for the just completed year as follows: **(18)**

	Tk.
Finished goods inventory, opening	20,000
Finished goods inventory, ending	40,000
Depreciation, factory	27,000
Administrative expenses	110,000
Utilities (70% for factory)	8000
Maintenance, Factory	12,000
Salesman's salaries	20,000
Purchase of raw materials	125,000
Raw materials inventory, opening	9000
Raw materials inventory ending	6000
Direct labour	70,000
Indirect labour	15,000
Work-in-process, opening	17,000
Work-in-process, ending	30,000

Requirement:

Prepare a schedule of cost of goods sold.

(c) How does income statement prepared for managerial decision making purpose differ from the income statement prepared for external user groups? **(5)**

SECTION – B

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

5. (a) What is the difference between revenue and gain? Explain with examples. **(5)**

(b) Mount view Motel has the following transaction on May, 2010. **(30)**

May-1:	The owner Investment Tk. 1000000 Cash.
„ - 2:	Advertised the business in 'Daily Star' for Tk. 5000 on account.
„ - 6:	Purchased supplies for cash Tk. 60000;
„ - 10:	Purchased office equipment for Tk. 250000; Paying Tk. 50000 in cash and remaining on account.
„ - 12:	Provided services and billed client for Tk. 300000.
„ - 15:	Withdraw cash for personal use Tk. 10000.
„ - 18:	Salary for the month paid in cash Tk. 25000.
„ - 20:	Paid balance due to Daily Star.
„ - 22:	Received from customer on account from May-12 transaction.
„ - 24:	Provide services for cash tk. 20000.

Contd P/4

HUM 303(MME)

Contd ... Q. No. 5(b)

Required:

(i) Prepare the tabular summary of the transaction,

(ii) Prepare an Income Statement for the month.

6. (a) What is the trial balance and what are it's purpose? **(3)**

(b) Following are the account balances of Butterfly Computer Service Limited for the year on 30th June, 2012: **(8)**

Cost of computer Tk. 2000000; Sale of Computer Tk. 3400000; Service fees received Tk. 300000; Salaries to engineers Tk. 200000; Advertisement expense Tk. 50000; Office rent Tk. 60000; Maintenance expense Tk. 130000; Accounts payable Tk. 80000; Tax payable Tk. 5000; Bad debts Tk. 50000; Prepaid Insurance Tk. 50000; Office equipment Tk. 60000; Salary to staff Tk. 85000; Bank Balance Tk. 455000; Unpaid salaries Tk. 5000; Accounts receivable Tk. 600000; Opening stock of computer Tk. 400000; Furniture Tk. 250000; Capital Tk. 600000.

Required: Prepare a Trial balance on 30th June, 2012.

(c) A company is considering an investment proposed to install a new machine at a cost of Tk. 50000. The estimated cash flows from the investment proposal are as follows: **(24)**

Year	CFAT (Cash Flow Adjusted Time)
1	10000
2	10450
3	11800
4	12250
5	16750

Required: Determine-

(i) Pay Back period

(ii) Internal Rate of return (IRR).

(iii) Net Prevent Value (NPV) at 10% cost of capital

(iv) Profitability Index (PI) at 10% discount rate.

7. (a) What is the time period assumption? How is it related to adjusting entry? **(5)**

(b) The trial balance of LG Electronics at January 31, 2011 in given below: **(30)**

LG Electronics

Trial Balance

January 31, 2011

Account Title	Debit (Tk.)	Credit (Tk.)
Cash	12800	
Supplies	2500	
Prepaid Insurance	3000	
Office equipment	5000	
Note payable		5000
Accounts payable		2500

Contd P/5

HUM 303(MME)

Contd ... Q. No. 7(b)

Unearned revenue		1200
Capital		10000
Drawings	500	
Service revenue		10000
Salary expense	4000	
Utility expense	900	
Total	28700	28700

Analysis reveals the following additional data:

- Supplies on hand at January 31. Tk. 1200.
- Insurance policy is for two years.
- Depreciation Tk. 200 for each month
- Unearned revenue is still unearned Tk. 800
- Interest accrued at January Tk. 200
- Service provided but not recorded Tk. 1200

Required: (i) Prepare adjusting entries.

(ii) Preapare adjusted trial balance as on January 31, 2011.

8. The followings is the trial balance of Tom Company as on 31st December, 2011. **(12+18+5)**

	Debit (Tk.)	Credit (Tk.)
Sales Revenue		50000
Merchandise Inventory (01.01.11)	6000	
Purchase	24000	
Purchase return		1000
Sales discounts	2500	
Accounts Receivable	20000	
Accounts payable		14000
Capital		40000
Drawings	10000	
Salaries	8000	
Supplies	3000	
Delivery Van	20000	
Cash	9300	
Prepaid Insurance	2200	
Total	105000	105000

Other information:

(i) Supplies used Tk. 1200

(ii) Depreciation on delivary Van is Tk. 2000

(iii) Merchandise Inventory (31.12.11) was Tk. 5500

(iv) Tk. 2500 of accounts receivable was uncollectible.

(v) Salaries were accrued Tk. 4000

(vi) Insurance expanse was Tk. 2000

Required: (a) Prepare multiple step Income statement for the period enclosed 31st December, 2011.

(b) Prepare statement of owners equity and Balance Sheet as on 31st December, 2011.

(c) Determine Profit Margin ratio, Inventory turnover ratio and current ratio.

L-2/T-2/MME Date : 10/08/2015

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2013-2014

Sub : **HUM 103** (Economics)

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) Explain the following concepts: **(9)**

   (i) Gross Domestics Product (GDP)

   (ii) Gross National Product (GNP)

   (iii) Net National Product (NNP).

   (b) Explain the various methods of measuring national income of a country. **(10)**

   (c) Discuss the circular flow of income and expenditure in a two sector economy. **(8)**

   (d) Calculate national income from the following information:

   GNP = Tk. 1,15,000 crore

   Depreciation = Tk. 9,500 crore

   Indirect tax = Tk. 12,700 crore

   Subsidy is 20% of indirect tax.

2. (a) Write down the statement of application of Euler's theorem in the theory of distribution of production. How can you show the exhaustion of factor income according to Euler's theorem? **(12)**

   (b) Briefly explain the various difficulties in the measurements of national income of a country. **(11)**

   (c) Briefly discuss the various policies for controlling inflation with reference to the context of Bangladesh. **(12)**

3. (a) Explain the process of resource allocation in a society with the help of production possibility frontier. **(15)**

   (b) Briefly discuss the various internal and external economics of scale. **(10)**

   (c) Critically analyse the concept of optimization. **(10)**

4. (a) Make a comparison between perfectly competitive market and oligopoly market. **(5)**

   (b) Explain the short-run equilibrium of a firm under monopoly market. **(8)**

   (c) What is meant by the shut-down point of production of a firm? Explain graphically the shut-down point of production of a firm under perfect competition. **(7)**

Contd P/2

HUM 103(MME)

Contd ... Q. No. 4

(d) Given the following total revenue (TR) and total cost (TC) functions for a firm **(15)**

$TR = 1400Q - 7.5\ Q^2$

$TC = Q^3 - 6Q^2 + 140Q + 750$

Where Q is quantity of output.

(i) Set up the profit function.

(ii) Find out the quantity which makes the profit maximum.

(iii) Find the maximum profit and verify that it is maximized.

SECTION – B

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

5. (a) From the following demand function, make a hypothetical demand schedule and plot the curve. $Q = 80 - 20P + P^2$. **(10)**

(b) What are the main causes of shifting of the demand curve? Explain them. **(10)**

(c) Why do demand curves generally slope downward? **(10)**

(d) What are the differences between change in demand and change in quantity demanded? **(5)**

6. (a) How would you measure price elasticity of demand at any point of a straight line demand curve? Explain graphically. **(15)**

(b) Define cross elasticity of demand and income elasticity of demand. **(10)**

(c) From the following table calculate elasticity of demand if you move from point A to C and explain what you understand from the result. **(10)**

POINT	Y	Q
A	1500	50
B	1600	60
C	1700	70

7. (a) Explain the properties of an indifference curve. **(10)**

(b) Explain consumer's equilibrium with the help of budget line and indifference curve. **(10)**

(c) What are the assumptions of the indifference curve analysis? **(5)**

(d) From the following budget line and the utility function, calculate the amount of two commodities that maximizes satisfaction. What is the maximum amount of satisfaction? **(10)**

$$5000 = 45X + 55Y$$

$$U = 500X^{0.6}Y^{0.7}$$

8. (a) Explain any two characteristics of a least developed country like Bangladesh. **(10)**

(b) What is meant by vicious circle poverty? Discuss the pattern of vicious circle of poverty both in demand and supply side? **(13)**

(c) Discuss the operation of four wheels of growth in developing countries. **(12)**

L-2/T-2/MME **Date : 08/07/2015**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2013-2014

Sub : **MME 213** (Phase Diagrams and Transformations)

Full Marks : 280 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **EIGHT** questions in this Section. Answer any **SIX**.

1. What do you understand by Gibbs Phase Rule? For a binary isomorphous system, explain how this phase rule helps to determine the shape of phase diagram. **(23 ⅓)**

2. What do you understand by miscibility gap? Show how eutectic and peritectic phase diagrams can evolve from isomorphous phase diagrams, given there are some miscibility in the components. **(23 ⅓)**

3. (a) During solidification of a eutectic alloy, describe the growth of eutectic phase using diffusion fields of the phases involved. **(12)**

   (b) Write a short note on different types of eutectic morphologies. **(11 ⅓)**

4. What do you understand by diffusion in a metallic couple? Derive Fick's first law. **(23 ⅓)**

5. (a) Narrate the applications and limitations of phase diagrams. **(15)**

   (b) Briefly discuss the following instances where phase diagrams and phase relationships have proved invaluable in the efficient solving of practical metallurgical problems: (i) Permanent Magnets and (ii) Electric Motor Housings. **(8 ⅓)**

6. For a Sn-30% Pb alloy (See Fig. 1) determine the phases present, their amounts, and their compositions at 300°C, 200°C, 184°C, 182°C and 0°C. Also, determine the amounts and compositions of each microconstituent for this alloy immediately after the eutectic reaction has been completed. **(23 ⅓)**

7. Using space model, briefly discuss a ternary system containing a eutectic reaction. **(23 ⅓)**

8. What do you understand by monotectic reaction? Draw a hypothetical monotectic binary phase diagram, and describe, with the help of microstructure, freezing of a hypo monotetic alloy in the equilibrium condition. **(23 ⅓)**

Contd P/2

MME 213

SECTION – B

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

9. (a) What is peritectic reaction? Why is a peritectic reaction often incomplete? Which reaction would you expect to take place more rapidly, a peritectic or peritectoid? Why? **(21 ⅓)**

   (b) With reference to a hypothetical equilibrium diagram, describe how coring occurs during solidification, under normal industrial conditions, of a solid-solution alloy. Describe how coring is prevented or removed. **(25)**

10. (a) Explain 'order – disorder transformation'. **(16 ⅓)**

    (b) Outline the problems and principles of interpretation of complex phase diagrams. **(30)**

11. (a) Draw the isothermal transformation diagram for an iron-carbon alloy of eutectoid composition and sketch and label time-temperature paths on this diagram to the following microstructures: (i) 100% coarse pearlite, (ii) 50% martensite and 50% pearlite (iii) 100% martensite. **(20)**

    (b) Describe the mechanism of the transformation of austenite to pearlite. **(20)**

    (c) What is bainite? **(6 ⅓)**

12. (a) What is the distinction between hypoeutectoid and hypereutectoid steels? **(8)**

    (b) In a hypoeutectoid steel, both eutectoid and proeutectoid ferrite exist. Explain the difference between them. What will be the carbon concentration in each? **(10)**

    (c) Compute the mass fractions of ferrite and cementite in pearlite. **(8)**

    (d) Compute the mass fractions of proeutectoid ferrite and pearlite that form in an iron-carbon alloy containing 0.35 wt% C. **(8)**

    (e) Mention two differences between martensitic and pearlitic transformations. **(12 ⅓)**

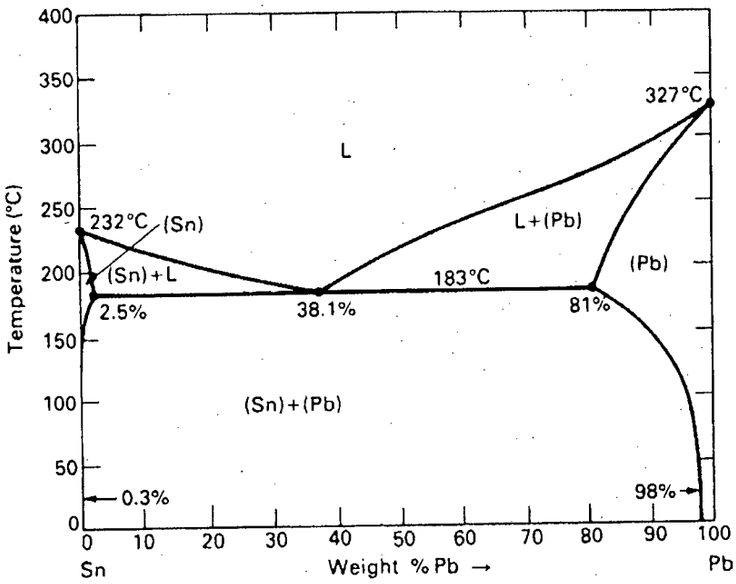

Fig. 1 for Question 6