BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2013-2014

Sub : **NAME 351** (Ship Structure)

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 reasonable values of any missing data.

1. (a) Classify the framing system of ship structure. Compare the advantages and disadvantages of longitudinal and transverse framing system.   **(15)**

(b) In a calculation of longitudinal strength for sagging condition, the following mean ordinates in tonnef/m were found for sectional lengths of a ship each 12 m long starting forward: **(20)**

Section	1	2	3	4	5	6	7	8	9	10	11
Weight	8.3	12.6	24.2	48.2	66.2	70.0	65.1	40.7	23.3	13.0	6.0
Buoyang	24.8	40.6	39.2	33.6	28.2	30.0	39.6	48.7	47.4	36.0	9.5

Draw the shearing force and bending moment diagrams and state the positions and values of the maxima.

2. (a) Discuss briefly the effect of wave length, wave height and wave shape on the longitudinal strength of ship.   **(12)**

(b) Consider a vessel of constant rectangular cross-section, 140 m long, 20 m beam and 13 m deep, with total mass 25830 tonnes, 20830 tonnes of which is uniformly distributed over the length and the rest distributed uniformly over central 10 m. Calculate bending moments and shearing forces at amidships. Suppose now that the vessel is poised on a sinusoidal wave equal to its own length 140 m and height 7.2 m. What will be the wave bending moments at amidships and the total bending moments at amidships?   **(23)**

3. (a) Describe J.H. Biles method for the calculation of weight distribution of continuous materials of ship. Also mention the assumptions and limitations of this method.   **(15)**

(b) A steel wide flange beam has the dimensions shown in Figure 3(b). If it is subjected to a shear of Q = 80 kN, plot the shear stress distribution acting over beam's cross-sectional area.   **(20)**
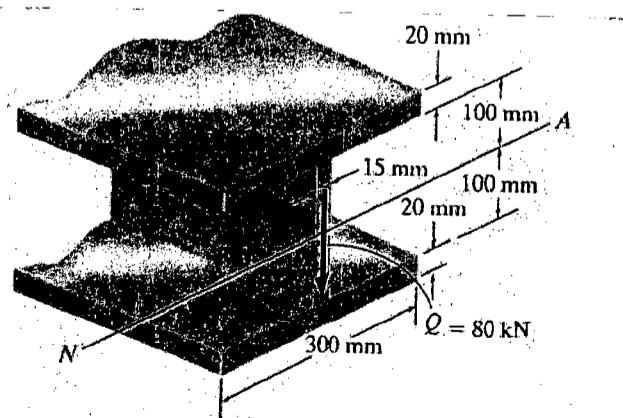

Figure for Question no. 3(b)

NAME 351

4. (a) What is period of encounter? Show mathematically that the maximum heaving force in regular seas of a vessel of constant rectangular cross-section is a function of direction of the waves, ship length to wave length ratio and the shape of the waterline. **(20)**

(b) A pontoon of constant rectangular cross-section is 63 m long, 10.5 m beam and floats in fresh water at a uniform draught of 3 m. Its weight is uniformly distributed over the entire length. A load 'W' is placed aft of amidships causing the draughts to become 3.9 m aft and 2.7 m forward. Find the value of 'W', its distance from amidships and the value of the bending moment at amidships caused by its addition. **(15)**

SECTION – B

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

5. (a) What is simple grillage? Find the reaction force at the intersection of a simple grillage. Also draw the bending moment diagram. Hence discuss when one of the beam lengths is very rigid and very flexible. **(20)**

(b) What is stress concentration? Discuss how to reduce stress concentration at the ends of a superstructure. **(15)**

6. (a) What is moment distribution factor? Mathematically derive the moment distribution factor at the junction of a portal and show that sum of the moment distribution factor at the junction is equal to one. **(15)**

(b) A bulkhead is flooded on one side to the top edge with sea water. The vertical stiffeners have a length of 9 m, spaced 0.75 m apart and free at each end. Determine the total load on a stiffener, the shearing force at the ends, the position of zero shear and the maximum bending moment. **(20)**

7. (a) A simply supported plate of length 'a' and breadth 'b' is subjected to uniformly distributed load. Find the amplitude of the plate deflection. **(20)**

(b) In converting a steel survey ship, it is proposed to extend short forecastle for the whole length of the ship and to arrange the structure so that it contributes 100% to the hull girder. The new structure is wholly of light alloy. Estimate the new nominal stress due to change in section modulus assuming that the bending moment remains unchanged. **(15)**

Before conversion: BM = 7742 tonnef-m,

$I = 23970$ cm^2-m^2, A = 4520 cm^2, $Y_{deck} = 2.9$ m and $Y_{keel} = 3.05$ m.

Added structure: Side plating 2.3 m × 10 mm stiffened by one 26 cm^2 girder at mid height; deck plating 11 m × 10 mm stiffened by five 26 cm^2 girders with center of area 8 cm below the deck.

(E-light alloy = 63 GPa ; E-steel = 207 GPa)

NAME 351

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

Figure for Q. No. 7(b)
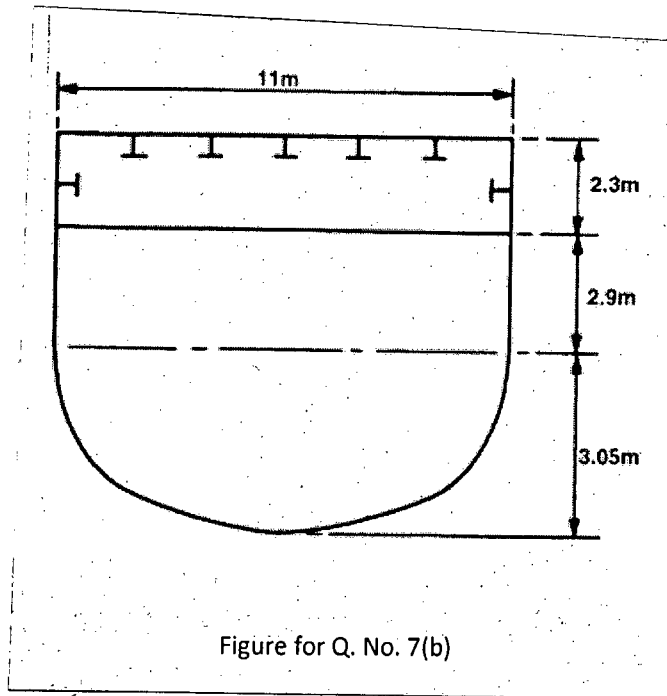
8. (a) Mathematically show the ratio of the spacing of the transverse stiffeners to the thickness of the plating will govern the buckling stress. **(10)**

(b) Discuss the effect of longitudinal and transverse stiffener on the buckling strength of the plate. **(10)**

(c) Derive the three moment equation of a continuous beam. **(15)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2013-2014

Sub : **NAME 323** (Resistance and Propulsion of Ships)

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**.

Symbols have their usual meaning.

Reasonable value can be assumed for any missing data

1. (a) With neat sketches, describe the geometry of a marine propeller.   **(25)**

    (b) In a propeller of 5.0 m diameter and 4.5 m pitch, radial lines from the leading and trailing edges of the section at 0.7R make angles 40 and 28 degrees with the reference plane through the propeller axis. Determine the width of the expanded blade outline at 0.7R considering that the section is flat faced.   **(10)**

2. (a) Describe the blade element theory of screw propeller action.   **(20)**

    (b) Derive the condition for minimum loss of energy according to the circulation theory of screw propeller.   **(15)**

3. (a) Derive the expressions of bending moments due to thrust and torque of a screw propeller and hence prove that $M_T = 0.2376 \dfrac{TD}{z}$ and $M_Q = 0.6691 \dfrac{Q}{z}$.   **(20)**

    (b) The areas of blade sections at various radii of a propeller of 3.0 m diameter are as follows: **(15)**

γ/R	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Area (m^2)	0.0651	0.0802	0.0802	0.0807	0.0691	0.0538	0.0358	0.0168	0

The propeller runs at 180 rpm. The propeller is made of Manganese Bronze with a density of 8300 kg/m^3. Determine the centrifugal force on the blade if the root section is at 0.2R. If the centroid of the section is at distances of 0.150 m and 0.035 m from the line of action of the centrifugal force measured parallel and perpendicular to the propeller axis, determine the bending moments due to rake and skew.

4. The ship trail data and model experimental results of a ship are provided below: **(35)**

Run No.	Shaft power, Ps from ship trial (kw)	Mean speed V_w (knot)	Propulsive coefficient, QPC from model experiment	Residuary resistance coefficient, C_R from model experiments
1–3	13049	21.5	0.715	1.420×10^{-3}
4–6	17679	22.8	0.707	1.889×10^{-3}

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Contd ... Q. No. 4

Ship length, L_{WL} = 159.54 m

Ship Wetted surface area, S = 4288.74 m^2

Ship displacement, Δ = 16717 tonne

Density of sea water, ρ = 1026.5 kg/m^3

Kinetic viscosity of seawater, v = 1.2788 × 10^{-6} m^2/s

Derive the model-ship correlation allowance, 'C_A'. Estimate also the ship trial and service power for the derived correlation allowance, 'C_A' and service allowance, $(1 + C_2)$ = 1.27.

SECTION – B
There are **FOUR** questions in this section. Answer any **THREE**.
Assume reasonable value of any missing data.

5. (a) Describe with Figure the different components of specific resistance of ships. **(15)**

   (b) Prove with the help of dimensional analysis, the total resistance of a ship is a function of Reynolds no. and Froude no. **(20)**

6. (a) What is corresponding speed? Explain why both Reynolds and Froude similarity does not exist at the same time? **(9)**

   (b) Explain why flow separation occurs around the ship hull. **(6)**

   (c) A 6 m model of a 180 m long ship is towed in a model basin at a speed of 1.61 m/s. The towing pull is 20 N. The wetted surface of the model is 4 m^2. Using geometric and Froude similarity estimate: **(20)**

       (i) corresponding speed of ship in knots.

       (ii) frictional resistance of both model and ship using ITTC-57 formula.

       (iii) wave making resistance of both model and ship, and

       (iv) effective power of ship in KW.

7. (a) Show that the wave making resistance coefficient of a ship is a function of fourth power of its speed. Also explain when hump and hollow occur. **(20)**

   (b) What are the ways reducing wave-making resistance of a ship? **(5)**

   (c) What are the advantages and disadvantages of bulbous bow in ship? **(10)**

8. (a) What is ship squat? What are signs that a ship has entered shallow water conditions? **(15)**

   (b) It is required to determine the reduction in speed when a vessel travelling into shallow water [Channel cross section shown in Figure for Q. No. 8(b)(i)] conditions from deep water. The main particulars of the vessel are: **(20)**

       L = 176 m

       B = 22.8 m

       T = 6.70 m and

       C_M = 0.80

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Contd ... Q. No. 8(b)

The girth of the vessel at the maximum cross-sectional area can be assumed to be 30% of the sectional area (values) and normal service speed of the vessel in deep water is 27 knots. Determine the reduction in speed in both shallow water and canal using Schlichting's and Landweber's method. (See Fig. for Q. No. 8(b)(ii)].
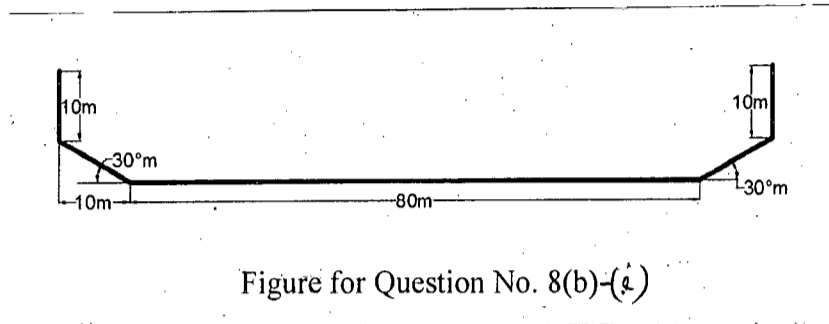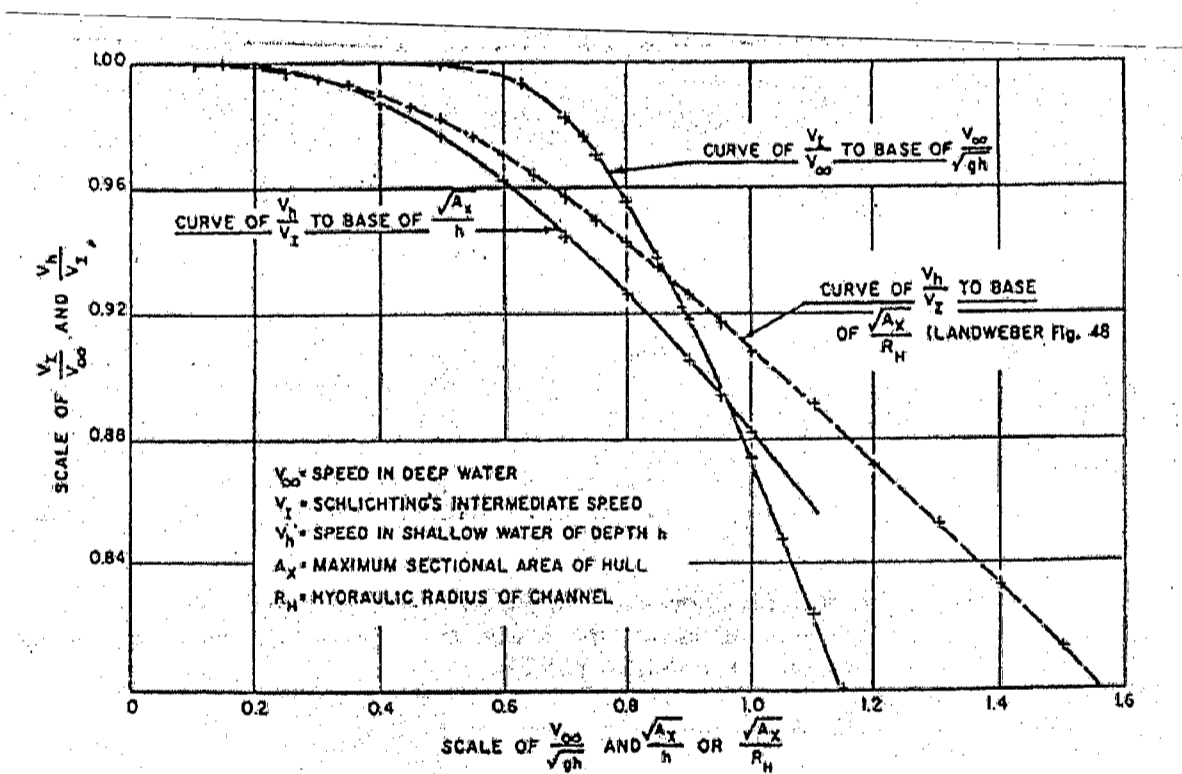
Figure for Question No. 8(b)-(i)

Figure: Curves of velocity ratios for calculating resistance in shallow water
(Schlichting's and Landweber's)

Fig for Ques No. 8(b)-(ii)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2013-2014

Sub : **NAME 335** (Port and Harbor Engineering)

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) Discuss how transport functions lead to the development of public and private ports. What are the considerations that need to be kept in mind in discussing the issue of public vs. private ports? Write also the competitive factors that affect this competition.   **(18)**

   (b) What are the functions of a port? Draw neat figures depicting the port life cycle and elements in the transport chain.   **(17)**

2. (a) Discuss the following stages of port planning tasks. (Draw figures if necessary)   **(28)**

   (i) Functional requirements and planning elements.

   (ii) Site data

   (iii) Layout development.

   (b) What are the specific problems with regard to port planning that may arise in the developing world?   **(7)**

3. (a) Draw a flow chart depicting the master plan process of development of a port design.   **(15)**

   (b) Discuss the design parameters that affect the planning of "Approach Channels". Discuss also the factors which influences a ship's maneuvering ability.   **(20)**

4. (a) Discuss the various components of a port terminal. What are the different types of terminals?   **(15)**

   (b) What are the advantages and disadvantages of different types of transport systems between quay and the storage area? Draw a neat figure of a typical container terminal layout.   **(20)**

SECTION – B

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

Assume reasonable values for any missing data.

5. (a) What factors dictate the size and shape of the harbor? Schematically draw a typical layout for a medium size artificial harbor with full size turning basin.   **(15)**

   (b) Define breakwater. What are the types of breakwater? Explain with neat sketches the types of floating breakwaters and its fundamental aspects.   **(20)**

NAME 335

6. (a) Define vertical breakwaters. Discuss in brief the types, components and construction of vertical breakwater. **(23)**

   (b) Make a comparison between various types of fender systems. **(12)**

7. (a) A general cargo carrier has the following particulars – **(18)**

$L_{BP} = 180$ m

$B = 26$ m

$D = 16$ m

deadweight = 31,000 tonnes

Draft, $T = 11$ m

$C_B = 0.76$

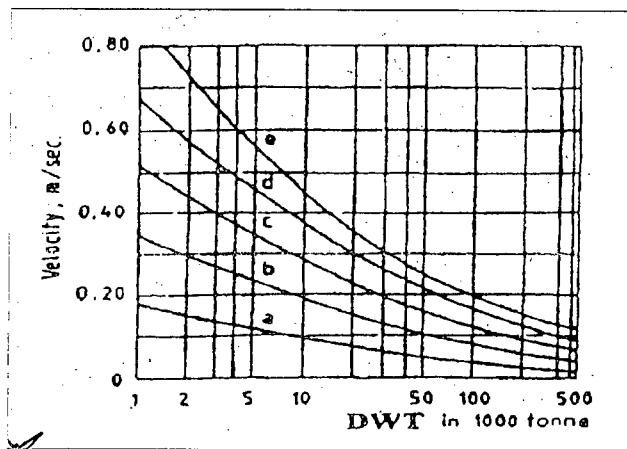Find the berthing energy for sheltered and good berthing conditions. Assume hard fenders and open berths.

Figure for Q. No. 7 (a)

   (i) Good berthing conditions, sheltered

   (ii) Difficult berthing conditions, sheltered

   (iii) Easy berthing conditions, exposed

   (iv)* Good berthing conditions, exposed

   (v)* Navigation conditions difficult, exposed

   (b) What are the reasons for using fenders? Discuss the factors upon which the selection of the optimum fender type for a given application depends. **(12)**

   (c) Write a short note on 'Dolphins'. **(5)**

8. (a) What is harbor? What are the classifications of harbor? Give short description of each type of it. **(18)**

   (b) Describe the procedure by which you can determine the best location of harbor. Also determine the location and width of entrance to harbor. **(17)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2013-2014

Sub : **NAME 371** (Finite Element Method for Ship Structure)

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**.

Symbols have their usual meanings. Assume any missing data.

1. (a) A concentrated load P = 50 kN is applied at the center of a fixed beam of length 3 m, depth 200 mm and width 120 mm. Calculate the deflection and slope at the mid point. Assume E = 200 GPa. Figure for Q. No. 1(a) shows the boundary conditions. **(20)**

   (b) Prepare element stiffness matrix for the member of plane frame shown in Fig. for Q. No. 1(b). Take E = 200 GPa, I = 4×10^{-6} m^4 and A = 4×10^{-3} m^2. **(15)**

2. (a) Consider the four element CST model shown in Fig. for Q. NO. 2(a) subjected to a body force f = y^2 N/m^3 in the y direction. Assemble the global load vector for the model. **(15)**

   (b) Derive the shape functions of a CST element in terms of natural coordinate system. **(20)**

3. (a) What is Jacobean matrix? Establish the Jacobean matrix of the elements shown in Fig. for Q. No. 3(a). **(20)**

   (b) Explain Hermite shape function and its use. **(8)**

   (c) Discuss about the quality of CST and 4 node quadrilateral elements. **(7)**

4. (a) The coordinates of the element shown in Fig. for Q. No. 4(a) are given in inches. Assume thickness as 0.1 inch. Prepare the load vector. **(10)**

   (b) For a tetrahedral element, derive the expression for strain displacement matrix. Discuss on element body force vector and element traction load vector. **(25)**

SECTION – B

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

5. (a) Derive the equations of equilibrium in case of a three dimensional stress system. **(15)**

   (b) Determine the displacements of nodes of the spring system shown in Fig. for Q. No. 5(b). **(20)**

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6. (a) Show that in elasticity problems Galerkin's method turns out to be the principle of virtual work. **(15)**

(b) Determine the nodal displacements, element stresses, and support reactions of the bar as shown in Fig. for Q. No. 6(b). Use the penalty approach for handling the boundary conditions. **(20)**

7. (a) Briefly explain the structure of a finite element analysis program. **(10)**

(b) Consider a rigid bar of negligible mass, pinned at one end and supported by a steel rod and an aluminium rod as shown in Fig. for Q. No. 7(b). A load $P = 30 \times 10^3$ N is applied. Develop the modified stiffness matrix and load vector. Also determine element stresses. **(25)**

8. (a) Write short note on pre and post processors. **(10)**

(b) Consider the four-bar truss as shown in Fig. for Q. No. 8(b). **(25)**

        (i) Determine the element stiffness matrix for each element.

        (ii) Assemble the structural stiffness matrix K for the entire truss.

        (iii) Using the elimination approach, solve for the nodal displacement.

        (iv) Recover the stresses in each element.
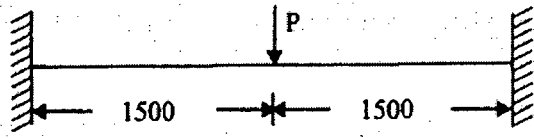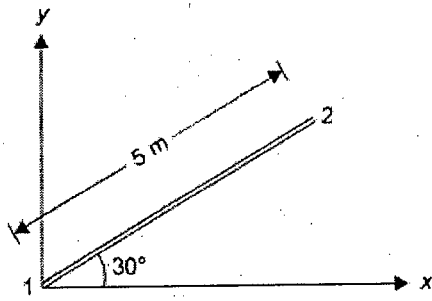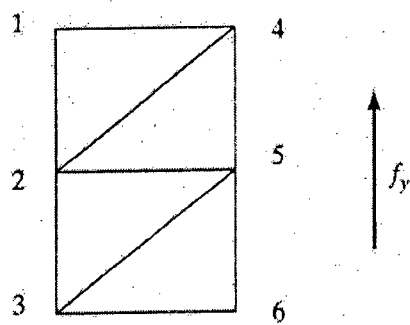
        (v) Calculate the reaction forces.

Figure for Q. No. 1(a)

Figure for Q. No. 1(b)

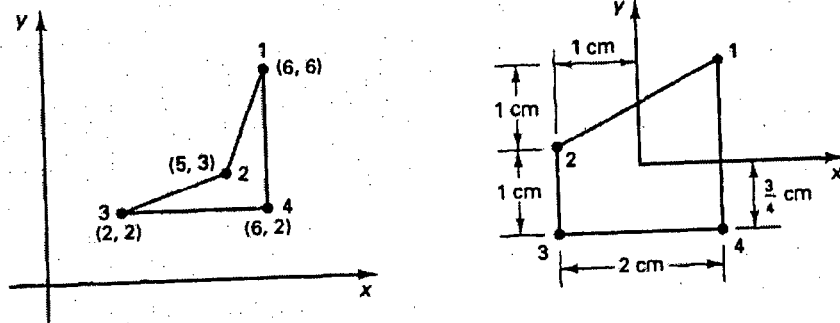| Coordinates, m		
Node	x-	y-
1	0	2
2	0	1
3	0	0
4	1.5	2
5	1.5	1
6	1.5	0

thickness = 1m

Figure for Q. No. 2(a)

Figure for Q. No. 3(a)

Figure for Q. No. 4(a)

40 N/mm

60 N → 1 — 80 N/mm — 2 → 50 N

50 N/mm

Fig. for Q. No. 5(b)

250 mm²   400 mm²

P = 300 kN

|← 150 mm →|← 150 mm →|← 300 mm →|
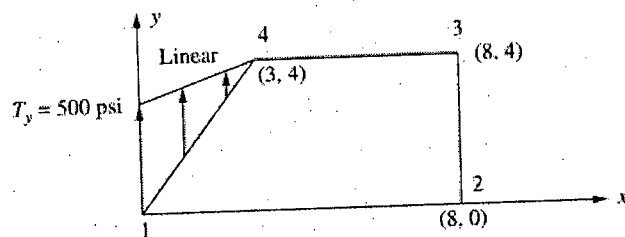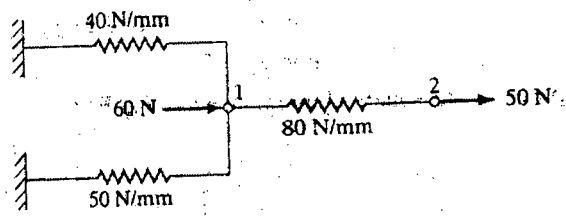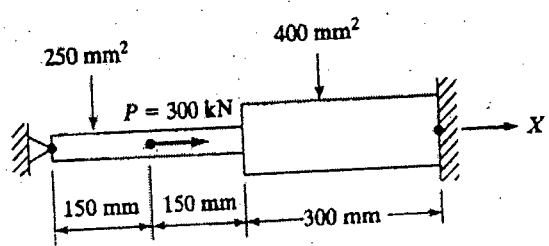
$E = 200 \times 10^9 \text{ N/m}^2$
(1 kN = 1000 N)

Fig. for Q. No. 6(b)
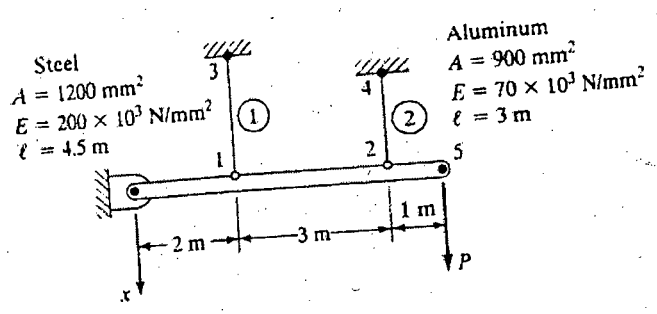
Steel
$A = 1200 \text{ mm}^2$
$E = 200 \times 10^3 \text{ N/mm}^2$
$\ell = 4.5 \text{ m}$

Aluminum
$A = 900 \text{ mm}^2$
$E = 70 \times 10^3 \text{ N/mm}^2$
$\ell = 3 \text{ m}$

|← 2 m →|← 3 m →|← 1 m →|

P

Fig. for Q. No. 7(b)

Y

Q_4

25 000 lb

Q_6

Q_7 ④ 3 Q_5

④

②

$E = 29.5 \times 10^6 \text{ psi}$
$A = 1.0 \text{ in}^2$

30 in. Q_2 ③

Q_4

Q_1 2 Q_3 20 000 lb → X

①

|← 40 in. →|

Fig. for Q. No. 8(b)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2013-2014

Sub : **NAME 345** (Welding Technology)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

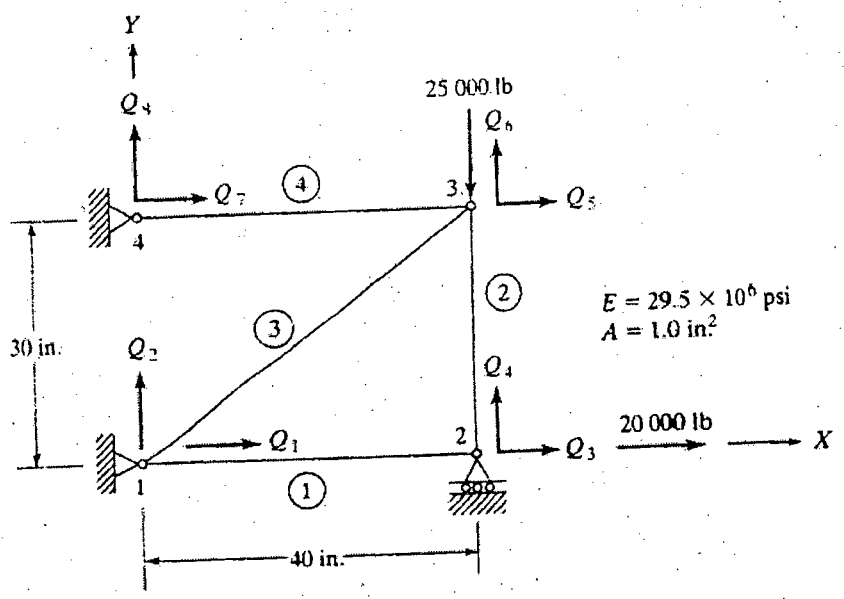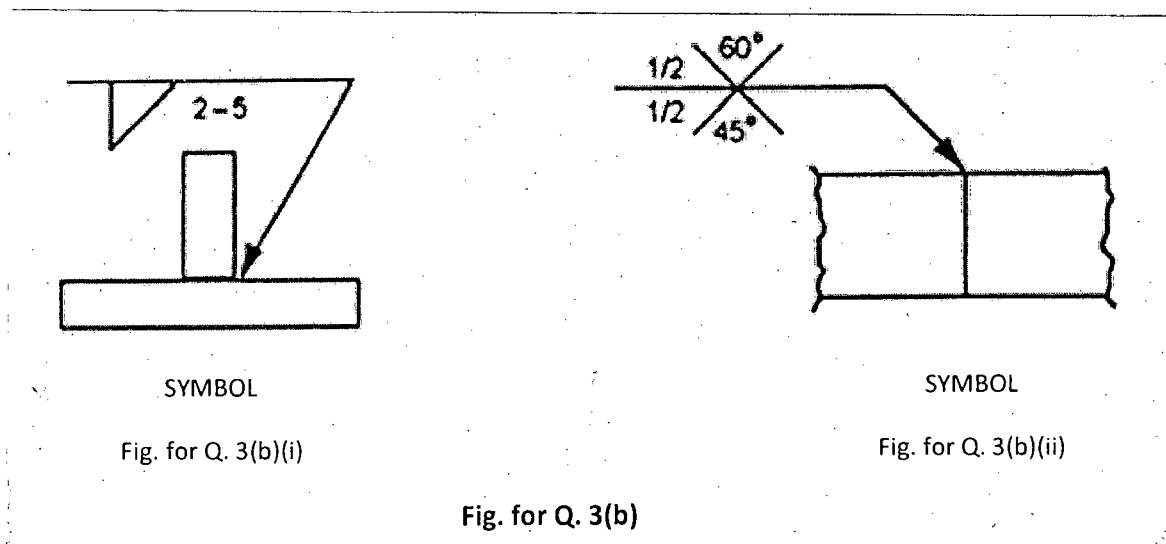## SECTION – A

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

1. (a) Describe the TIG welding process with figure. **(15)**

    (b) Discuss modes of metal transfer in MIG welding process. **(20)**

2. (a) What is welding arc blow? How it can be reduced? **(14)**

    (b) Write short notes on: **(21)**

         (i) Resistance welding

         (ii) Stick welding

         (iii) Flux-cored arc welding

3. (a) Write down the names of different types of defects and discontinuities found in welding. Mention the causes and remedies for the following welding defects: **(23)**

         (i) Porosity

         (ii) Arc Strike

         (iii) Arc Whiskers

         (iv) Convex bead finish

    (b) Sketch how the welds would appear as specified by the symbols in Fig. for Q. 3(b). Use a cross-sectional view of needed. **(12)**

SYMBOL   SYMBOL

Fig. for Q. 3(b)(i)   Fig. for Q. 3(b)(ii)

Fig. for Q. 3(b)

4. (a) With figure explain different types of weld and welding joint. **(17)**

    (b) Discuss the selection criterion of electrode for welding. **(12)**

    (c) Explain the following symbols of electrode specification according to AWS for SMAW process: **(6)**

         E 11011 - H8

NAME 345

SECTION – B

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

5. (a) What is non-destructive testing (NDT)? How can you determine a suitable NDT method for ship hull steel welds? **(10)**

(b) Discuss the basic principle of magnetic particle testing. **(10)**

(c) List the major steps involved in liquid penetrant testing. **(8)**

(d) Mention some advantages of ultrasonic testing. **(7)**

6. (a) With neat sketches, discuss the characteristics of different types of flames used in oxyacetylene welding. **(15)**

(b) Briefly describe the working principle of injector type welding torch. **(10)**

(c) What are the problems associated with cutting cast iron? Also mention suitable remedies for these problems. **(10)**

7. (a) Discuss the various indicators to judge the quality of a good oxygas cutting. **(10)**

(b) During an oxygas cutting process, what are the consequences if, **(15)**

(i) O_2 pressure is too low,

(ii) Speed of cutting is too fast,

and (iii) Using an oversized tip.

(c) What are the risks associated with underwater welding? **(10)**

8. (a) Write short notes on the followings: **(15)**

(i) Power tool cleaning

(ii) Abrasive blasting

(iii) Acid pickling

(b) Discuss the importance of steel surface preparation. **(10)**

(c) Briefly discuss various underwater welding processes. **(10)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2013-2014

Sub : **HUM 313** (Principles of Accounting)

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) Who are the users of accounting information?   (3⅓)

   (b) Jully Kart opened her own law office on July 1, 2012. During the first month of operations the following transactions occurred.   (12+8)

   • Invested Tk. 1000 on cash in the law practice.

   • Provided legal services to clients for cash Tk. 1500

   • Borrowed Tk. 700 cash from a bank on a note payable.

   • Paid Tk. 1700 for July rent office space.

   • Purchase office equipment on account Tk. 3000

   • Performed legal services for client on account Tk. 2000

   Required:

   (i) Prepare a tabular summary of the transaction.

   (ii) Prepare the Income Statement and Owner's equity statement.

2. (a) James Steve is a licensed CPA. Following are the transactions occurred in May: (18⅓)

May 1:	Steve Invested Tk. 25000 cash.
May 2:	Hired a secretary-receptionist at a salary of Tk. 2000 per month.
May 3:	Purchased Tk. 2500 of supplies on account from Read Supply Company.
May 7:	Paid office rent of Tk. 900 cash for the month.
May 11:	Completed a tax assignment and billed client Tk. 2100 for services performed.
May 12:	Received Tk. 3500 advance on a management consulting engagement.
May 13:	Received cash Tk. 1200 for services completed H. Arnold Co.
May 31:	Paid secretary-receptionist Tk. 2000 salary for the month.
May 31:	Paid 40% of balance due Read Supply Company.

   Prepare the journal entities.

   (b) What are the three activities done under the recording process?   (5)

HUM 313/NAME

3. (a) Give two examples of prepaid expenses and unearned revenue. **(3 ⅓)**

(b) Emeril Corporation encounters the following situations: **(10)**

(i) Emeril collects Tk. 1000 from a customer in 2008 for services to be performed in 2009.

(ii) It incurs utility expense which is not yet paid in cash or recorded.

(iii) Employees worked 3 days in 2008, but will not be paid until 2009.

(iv) Earned service revenue but has not yet received cash or recorded the transaction.

(v) It paid Tk. 20000 rent on December 1 for the 4 months starting on December 1.

Identify the type of adjusting entry (prepaid expenses, unearned, revenue, accrued expenses, accrued revenue) is needed to each transaction.

(c) Terry Thomas opens the Green Thumb Lawn Care Company on April 1. At April 30, the trial balance shows the following balances for selected accounts. **(10)**

Prepaid Insurance	Tk. 3600
Equipment	28000
Notes payable	20000
Unearned revenue	4200
Service revenue	1800

Analysis reveals the following additional data:

(i) Prepaid insurance is the cost of a 2-year insurance policy effective from April 1.

(ii) Depreciation on the equipment Tk. 500 per month.

(iii) The note payable is dated April 1. It is a 6 month, 12% interest note.

(iv) Seven customers paid advance Tk. 100 each for services will be performed in May.

(v) Provide services to customers but not received Tk. 1500, at April 30.

Prepare the adjusting entries for April, Show computation.

4. (a) What is the difference between current liabilities and non-current liabilities? Explain with examples. **(3 ⅓)**

(b) The adjusted Trial Balance columns of Falcetto company's for the year ending on December 31, 2010 are as follows: **(15)**

Debit	Amount (Tk.)	Credit	Amount (Tk.)
Cash	14500	Accumulated Depreciation	18000
Accounts Receivable	11100	Note payable	25000
Merchandise Inventory	29000	Accounts payable	10600
Prepaid Insurance	2500	Falcetto, capital	81000
Store Equipment	95000	Sales	536800
Falcetto, Drawing	12000	Interest Revenue	2500
Sales return	6700		
Sales Discounts	5000		
Cost of goods sold	363400		
Freight-out	7600		
Advertising expenses	12000		

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

Debit	Amount (Tk.)	Credit	Amount (Tk.)
Salaries expense	56000		
Utilities expense	18000		
Rent expense	24000		
Depreciation expense	9000		
Insurance expense	4500		
Interest expense	3600		
	673,900		673,900

Instruction:

Prepare an Income Statement assuming Falcetto Company does not use classifications for operating expenses.

(c) What is ratio analysis? Find out the following ratios from the elements of part-b (Income Statement) answer. **(5)**

* Profit Margin ratio
* Inventory turnover ratio

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

5. (a) What is 'Break-Even Point'? **(2)**

(b) Prepare a contribution break-even chart and specify different terms in the chart (Use of graph paper is not necessary). **(3⅓)**

(c) Volter company manufacturers and sells a specialized cordless telephone for high electromagnetic radiation environments. The company's contribution format income statement for the most recent year is given below: **(18)**

Sales (20,000 units @ Tk. 60)	Tk. 12,00,000
Less: Variable cost	900,000
Contribution margin	300,000
Less: Fixed cost	240,000
Net income	60,000

Requirements:

(i) Compute the company's CM ratio and variable cost to sales ratio.

(ii) Compute the company's break-even point in both units and sales in Taka.

(iii) Assume that sales increase by Tk. 400,000 next year. If cost behavior patterns remain unchanged, by how much will the company's net income increase?

(iv) Refer to the original data, assume that next year management wants to earn a profit of Tk. 90,000. How many units will have to be sold to earn this target profit?

(v) Refer to the original data, compute the company's margin of safety in taka and in percentage form.

(vi) Compute the company's degree of operating leverage at the present level of sales.

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Contd … Q. No. 5(c)

Assume that company's sales increase by 8% next year. By what percentage would you expect net income to increase? Use degree of operating leverage (DOL) to obtain your answer.

Verify your answer as calculate above by preparing a new contribution format income statement showing an 8% increase in sales.

6. (a) What is the basic difference between absorption costing and variable costing?   (3 $\frac{1}{3}$)

   (b) Denton company produced and sells a single product. Cost data for the product are given below: (20)

Selling price per unit	Tk. 60
Manufacturing costs:	
Direct materials per unit	Tk. 7
Direct labour per unit	10
Variable manufacturing overhead per unit	5
Fixed manufacturing overhead in total	315000
Selling and administrative costs:	
Variable cost per unit sold	Tk. 3
Fixed cost for the period	245,000

Other information:

Units in beginning inventory	0
Units produced during the period	17,500
Units sold during the period	15,000
Units in ending inventory	2500

Requirements:

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

(ii) Prepare income statements under the both methods.

(iii) Explain the reason for any difference between the net income under the both methods.

7. (a) What do you understand by mixed cost and cost formula?   (2)

   (b) Electricity cost in explained by machine hours in Timber Assembly Plant. Related information for a representative year is provided below: (14 $\frac{1}{3}$)

Month	Machine Hours	Electricity Cost (Tk.)
January	34,000	640
February	30,000	620
March	33,000	630
April	39,000	590
May	42,000	500
June	32,000	530

Month	Machine Hours	Electricity Cost (Tk.)
July	26,000	500
August	26,000	520
September	31,000	530
October	35,000	550
November	43,000	580
December	48,000	680

Requirements:

(i) Using high-low point method, determine the variable costs per machine hour and total fixed costs.

(ii) Determine the cost formula for electricity cost in the form of $y = mx + c$.

(iii) Using the cost formula, calculate the total electricity costs if 40,000 machine hours have been worked for.

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

(c) Haaki Shop Inc., is a large retailer of water sports equipment. An income statement for the company's surfboard department for the most recent quarter is presented below: **(7)**

The Haaki Shop Inc.

Income Statement - Surfboard department

for the Quarter Ended May 31

Sales		Tk. 800,000
Less: Cost of goods sold		300,000
gross profit		500,000
Less: Operating cost		
Selling cost	Tk. 250,000	
Administrative cost	160,000	410,000
Net profit		90,000

The surfboard sell, on the average, for Tk. 4000 each. The departments variable costs are Tk. 50 per surfboard sold. The remaining selling cost are fixed. The administrative costs are 25% variable and 75% fixed. The company purchases its surfboards from a supplier at cost of Tk. 150 per surfboard.

Required:

Prepare an income statement for the quarter using contribution approach.

8. (a) Name the three types of inventories that appear on a manufacturer's balance sheet. Define each of them with an example. **(4⅓)**

(b) Various cost data and sales data for Stratford Company for the just ended year are as follows: **(19)**

Particulars	Tk.
Selling expenses	110,000
Rent show room	30,000
Opening raw materials	90,000
Ending raw materials	60,000
Plant utilities	36,000
Direct labor	300,000
Depreciation, plant equipment	162,000
Purchase of raw materials	750,000
Sales	30,00,000
Insurance for factory	40,000
Indirect labour	150,000
Maintenance for plant equipment	87,000
Legal fees	50,000
Directors fees	1,30,000
General expenses	40,000
Sales Managers' salary	20,000
Opening work-in process	180,000
Ending work-in process	100,000
Advertisement expenses	45,000
Opening finished goods	260,000
Ending finished goods	210,000
Clearing supplies, factory	7000
Rent ($\frac{2}{3}$ for factory, $\frac{1}{3}$ for office)	120,000
Gas and water, factory	2500
Carriage outwards	6000
Carriage inwards	7000

Requirements:
    (i) Prepare a cost of goods sold statement.

    (ii) Prepare an Income Statement.