L-3/T-1/NAME Date : 14/01/2017

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2015-2016

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**.

1. (a) Write the basic steps in the ship structural design process. **(15)**

   (b) Explain rationally based structural design process with necessary flow diagram. **(20)**

2. (a) Classify the framing system in a ship structure. Make a comparison between longitudinal and transverse framing system. **(15)**

   (b) Discuss the loads on the ship structure based upon the time frame of the load. **(20)**

3. (a) Describe briefly with figure the Biles and Cole method for the calculation of hull weight distribution. **(20)**

   (b) Consider a vessel of length 100 m resting in sheltered fresh water as shown in Fig. for Q. No. 3(b). The center of gravity (CG) of all weights forward of midships is 23 m forward of midships. The CG of all weights aft of the midships is 25 m aft of midships. The weights forward (fwd) and aft are 4200 and 4600 tonnes respectively. The (fore and aft) buoyancy forces act at the bonjean locations, which are 18 m fwd and 20 m aft of midships. The buoyancy force aft is 4650 tonnes. Determine the still water bending moment for this vessel using Murray's method. **(15)**

4. (a) A ship 240 ft long has the following mean values for weight and buoyancy as measured at the centers of each of the six displacement station. Find the bending moment at amidship. **(15)**

Station	Weight (tons/ft)	Buoyancy (tons/ft)
$\frac{1}{2}$	13.06	5.40
$1\frac{1}{2}$	25.70	20.90
$2\frac{1}{2}$	14.40	25.80
$3\frac{1}{2}$	12.40	22.20
$4\frac{1}{2}$	10.40	14.10
$5\frac{1}{2}$	15.64	3.20

   (b) The barge shown in Fig. for Q. No. 4(b) floats at a uniform draught of 1.25 m in sea water when empty. A heavy weight, uniformly distributed over the middle 5 m of the barge, increases the fraught to 2.5 m. It may be assumed that the buoyancy curves for the barge (loaded and unloaded) and the weight distribution of the unloaded barge are constant over parallel length of the barge, decreasing linearly to zero at the no ends. Find the bending moment at amidship. **(20)**

Contd P/2

NAME 351

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.
The symbols have their usual meanings.
Assume reasonable value in case of missing data.

5. (a) Consider a simply supported beam with a uniformly distributed load 'W' per unit length and assume that the section of the beam is rectangular of breadth 'b' and depth 'h'. Determine the shear deflection and ratio of shear deflection to bending deflection. **(20)**

   (b) A rectangular vessel is 15 m broad and 10 m deep and has deck plating 5 mm thick and sides and bottom 9 mm thick. It is subjected to a bogging bending moment of 65 MN-m. Determine the maximum tensile and compressive stresses. **(15)**

6. (a) Define period encounter. Derive the expression of heaving force in a regular seaway and hence show that for a vessel of constant rectangular cross-section and symmetrical about amidships, the maximum heaving force is a function of direction of waves, ship length-wave length ratio and the shape of the waterline. **(20)**

   (b) Define thin and thick plate. Consider a simply supported rectangular plate of length 'l' and breadth 'b'. The plate is subjected to a rate of loading given by the equation: **(15)**

$$P = P_o \sin \frac{\pi x}{l} \sin \frac{\pi y}{b}$$

   Find the edge moments M_x and M_y.

7. (a) In converting a steel survey ship shown in Fig. for Q. No. 7(a), it is proposed to extend the 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 stresses due to the change in section modulus assuming that the bending moment remains unchanged. **(20)**

   Before conversion: BM = 7742 tonnef/m
   $I = 23970 \text{ cm}^2 \text{ m}^2$
   $A = 4520 \text{ cm}^2$
   $y_{deck} = 2.90$ m
   $y_{keel} = 3.05$ m

   Added structure:
   Side plating 2.3 m × 10 mm stiffened by one 26 cm^2 at mid height.
   Deck plating 11 m × 11 mm stiffened by fine 26 cm^2 with centre of area 8 cm below the deck (Take E, light alloy = 69 GPa and E, steel = 207 GPa).

   (b) What are the measures adopted to avoid breakdown due to the high stresses generated in super structure ends. **(15)**

8. (a) Derive the expression of minimum critical buckling stresses of a simply supported rectangular plate. **(18)**

   (b) What is simple grillage? Find the reaction force at the intersection of a simple grillage and draw the bending moment diagram. Hence discuss when one of the beams is very rigid and very flexible. **(17)**

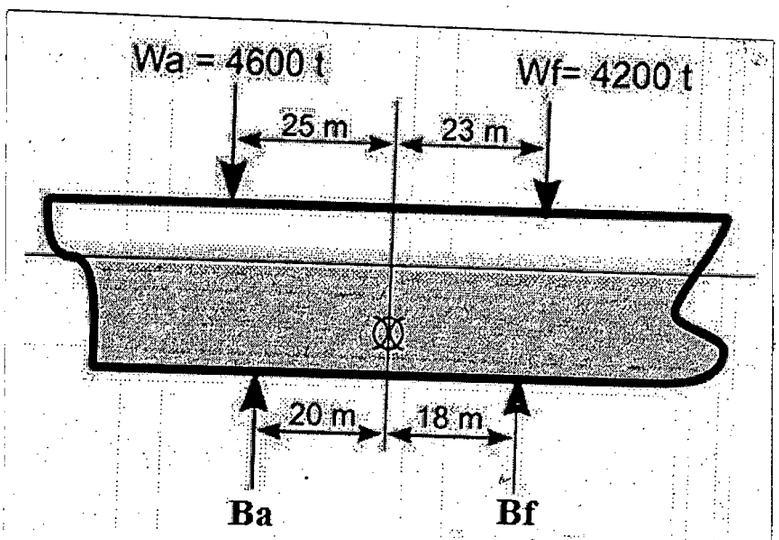


Fig for Question No. 3 (b)

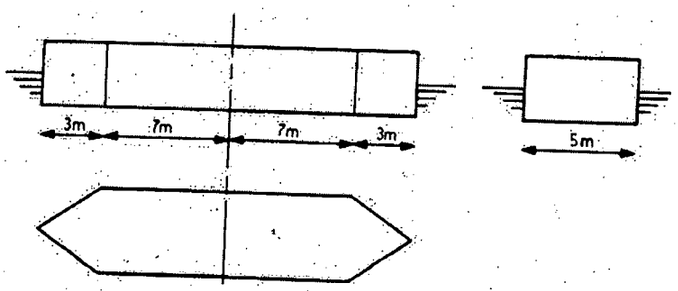


Fig for Question No. 4 (b)

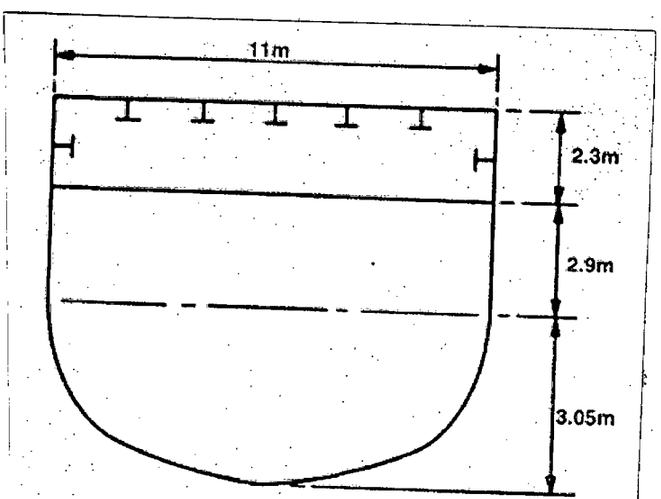


Figure for Q. No. 7(a)

L-3/T-1/NAME **Date : 18/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2014-2015

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 **FIVE** questions in this Section. Answer any **FOUR**.

1. (a) Can a business enter into a transaction in which only the left side of the basic accounting equation is affected? If so, give an example. **(4⅓)**

   (b) According to revenue recognition principle when should the revenue be recorded? **(4)**

   (c) Mr. Shamim started his business "Shamim Enterprise" at July 1, 2014. During his first month of operation he had the following transactions in July: **(15)**

July 1:	Started his business investing Tk. 960,000 cash and an equipment of Tk. 60,000.
July 2:	Paid office rent in advance for next two months Tk. 60,000 in cash.
July 4:	Purchase supplies on credit Tk. 10,000.
July 6:	Provide services and billed the client for Tk. 500,000.
July 8:	Purchase a car for office purpose for Tk. 1000,000. Paid Tk. 300,000 in cash and signed a notes payable for the remaining amount.
July 9:	Provide services to the client and received Tk. 500,000 in cash.
July 12:	Payment of notes payable Tk. 300,000 in cash related to transaction July 8.
July 15:	Made an additional investment by Mr. Shamim for Tk. 400,000 in cash.
July 20:	Owner withdrew Tk. 70,000 in cash from business for his personal needs.
July 22:	Paid utility Tk. 10,000 on cash.

Required:

(i) Prepare a tabular summary for the month of July.

(ii) Also prepare an income statement for the month.

2. (a) "Journal records data chronologically". Explain. **(5⅓)**

   (b) Mr. Rubel started a business. During January 2012, the following transactions occurred:

January 1:	Started his business with Tk. 120,000 in cash.
January 2:	Service provided to a customer but not yet received Tk. 60,000.
January 3:	Purchase supplies on account Tk. 30,000.
January 7:	Earned revenue Tk. 45,000 of which Tk. 10,000 is collected in cash and the balance was in January.
January 9:	Incurred utility expenses for the month on account Tk. 2,000.
January 11:	Made an investment by Mr. Rubel for Tk. 400,000 in cash.
January 13	Received Tk. 10,000 in cash from the customer.
January 15	Paid telephone bill for the month Tk. 5,000 in cash.
January 17:	Paid Tk. 15,000 to account payable for supplies.

Requirded: **(18)**

(i) Give journal entries for the month of January, 2012.

(ii) Prepare the ledger of "Cash Account".

Contd P/2

HUM 313(NAME)

3. (a) Write down the categories of adjusting entries. **(5⅓)**

(b) The Trial Balance of "Rangs Electornics" at June 30 2016 is given below:

Rangs Electronics Trial Balance June30, 2016		
Accounts Title	Debit (TK.)	Credit(Tk.)
Cash	26,500	
Supplies	2,500	
Prepaid insurance	30,000	
Office equipment	10,000	
Notes payable		50,000
Furniture	20,000	
Accounts payable		1,000
Unearned revenue		12,000
Capital		21,000
Drawings	500	
Service revenue		12,500
Salary expense	5,000	
Utility expense	1,000	
Interest expense	1,000	
Total	**96,500**	**96,500**

Other Information:

- Insurance policy is for 5 years.
- One third of the unearned revenue is earned at the end of the period.
- Supplies on hand at June 30,2016 Tk. 1200.
- Service provided to the customers but not recorded amount Tk. 2,000.
- Depreciation is Tk. 500 per month.
- Interest accrued at June 30, 2,500.

Required: **(18)**

(i) Prepare necessary adjusting entries.

(ii) Prepare an adjusted trial balance as at June 30,2016.

4. (a) What is intangible asset? Give example. **(5⅓)**

(b) The following accounts are taken from the ledger balances of "Brothers Furniture's Ltd" at 31st December, 2015:

Contd P/3

HUM 313(NAME)

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

"Brothers Furniture's Ltd"
Trial balance
31st December, 2015

Accounts Title	Debit (Tk.)	Credit (Tk.)
Cash	50,000	
Equipment	35,000	
Accounts receivable	20,000	
Accounts payable		10,000
Capital		50,000
Supplies	1200	
Trademark	25,000	
Tax payable		18,200
Salary expense	9,000	
Sales salary expense	3,000	
Notes payable		12,000
Store machinery	30,000	
Unearned revenue		20,000
Sales		150,000
Cost of goods sold (COGS)	50,000	
Prepaid insurance	4,000	
Rent expense	25,000	
Utility expense	8,000	
Drawings	2,000	
Long term investment	18,000	
Noncurrent liability		20,000
Total	**280,200**	**280,200**

Adjustments data:

(i) Depreciate is @ 10% on store machinery.

(ii) Two-thirds of the supplies were used during the period.

(iii) 60% of rent expense is relates to office and remaining to sales.

Required:

(i) Prepare a multiple step (classified) income statement for the year ended December, 2015.

(ii) Prepare an owners' equity statement and a classified balance sheet at 31st December, 2015.

SECTION – B

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

5. Crown creative inc. makes high quality Personal Digital Assistant (PDA). Sales and production data relating to the most recent year are given below: **(23 ⅓)**

Sales (in unit)	2800
Selling price per unit (Tk.)	265
Contribution margin ratio	60%
Annual Fixed costs (Tk.)	111,300

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

Contd P/4

HUM 313(NAME)

Contd ... Q. No. 5

Requriements:

(a) Compute break-even point in units and sales in Taka.

(b) Assume that sales increases by Tk. 60,000 next year. If cost behaviour patterns remain unchanged, by how much will the company's income increase?

(c) Refer to the original data. Assume that next year management wants to earn a Tk. 182,850 profit. How many units will have to be sold to meet this target profit?

(d) Refer to the original data. The sales manager is convinced that a 15% reduction in the selling price combined with a Tk. 56,100 increase in advertising expenditure could cause annual sales in units to increase by 40%, company should do as the sales manager suggests?

(e) Refer to the original data. Compute margin of safety both in taka and percentage form.

(f) (i) Compute degree of operating leverage at the present level of sales.

(ii) Assume that the company like to increase its net profit by 90% next year. By what percentage would you expect sales to increase? Use DOL to answer.

(iii) Verify your answer to (ii) by preparing income statement.

6. (a) In what situation , absorption costing will result in higher net income than variable costing? Why? **(3⅓)**

(b) For the income year ended on December 31, 2014; you have been given the information below: **(20)**

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

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

Requirements:

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

(ii) Prepare income statement under both of the methods.

7. (a) Classify costs in terms of cost behaviour. **(5⅓)**

(b) The data below have been taken from the cost records of Beverly Hospital. A careful study by the company's cost analyst has determined that if the number of x-rays taken is 7000, the average operating cost is Tk. 4.14 per x-ray. If the number of x-rays taken is 3000, the average operating cost is Tk. 5.65 per x-ray. **(12)**

Contd P/5

HUM 313(NAME)

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

Requirements:

(i) Using the high and low point method, determine the variable cost per x-ray and the fixed cost in total.

(ii) Express the variable cost and fixed cost in the form Y = mx + c.

(iii) If the number of X-rays taken in a month is 4600, what total operating X-rays cost would you expect?

(c) The Alex House Inc. is a large retailer of winter sports equipment. An Income statement for the company's Ski Department for a recent quarter is presented below:

Sales		Tk. 150,000
Less: Cost of goods sold		90,000
gross margin		60,000
Less Operating expenses		
Selling Cost	Tk. 30,000	
Administrative cost	10,000	40,000
Net profit		20,000

Ski's sell, on the average, for Tk. 750 per pair, variable selling cost are the 50 per pair Ski's sold. The remaining selling cost are fixed. The administrative cost are 20% variable and 80% fixed. The company does not manufacture its' own Ski's, it purchases them from a supplier for Tk. 450 per pair.

Requirements:

Prepare an Income statement for the quarter using the contribution approach.

8. (a) Define the terms "Manufacturing cost" and 'Non-manufacturing cost with examples. **(6⅓)**

(b) The following information has been taken from the accounting records of Enron Corporation for Last year, 2015: **(17)**

Material purchased	Tk. 100,000
Direct labour	200,000
Indirect labour	3,000
Sales man's salaries	25,000
Miscellaneous factory expenses	4,000
Fuel for the factory equipment	2,000
Factory insurance	8,000
Depreciation, factory plant	40,000
Depreciation, office equipment	12,000
Power and electricity	5,000
Sales	520,000
Advertisement	17,000
Office salaries	30,000
Office rent	20,000
Utilities (40% for factory, 60% for office)	15,000

Inventories	January 1	December 31
Raw materials	Tk. 10,000	Tk. 12,000
Work-in-process	15,000	9,000
Finished goods	5,000	7,000

Requirement:

(i) Prepare a cost of goods sold statement and

(ii) An income statement for the year.

L-3/T-1/NAME **Date : 24/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2015-2016

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) What do you understand by approach channel? Illustrate the requirements for the alignment of an approach channel. **(10)**

   (b) A port is planning to accommodate the Panamax Vessel considering the following factors: **(25)**

   Cross wind : 20 knots
   Cross current : 2 knots
   Wave height : 2.5 m

   Calculate the width of the approach channel considering two way traffic lane for sloping edge, soft bed and having VTS. Also calculate the depth of the channel if the vessel draft is 12 m and tidal elevation is 3 m above the reference level.

2. A port is to be designed for a throughput of 12,00000 TEU. Determine the number of berths and length of the berth considering a Panamax Vessel having length 185 m. The following information can be used as a basis for calculation: **(35)**

   TEU = 800000 Nos
   FEU = 400000 Nos
   Production/crane = 20 moves/hr
   No of crane/Berth = 02
   Berth occupancy = 0.65

   Considering 335 days as operational days in a year.

3. (a) Define dredging. Why dredging is required in a port or harbor? Classify and explain different types of dredging procedure. **(10)**

   (b) Assume a small terminal to be designed for a capacity of 100000 TEU/yr for which: **(25)**

   45,000 TEU Import (of which 15000 via CFS)
   35,000 TEU Export
   20,000 TEU Empties

   Considering container handling will be made by straddle carrier of stacking 3 high ($F = 13\ m^2$), calculate the area required for the terminal yard. Also draw a possible layout for the above terminal.

4. (a) Define fender. A fender system is to be designed for a berth considering the following particulars: **(27)**

   Vessel length : 190 m
   Breadth : 30 m

Contd P/2

NAME 335

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

Draft : 8.5 m
Block co-efficient : 0.80
Distance between C.G and the point of first contact : 70 m
Stiffness co-efficient : 0.90

Calculate the berthing energy to be absorbed by the fender system considering open jetty, favourable condition of current and wind.

(b) Write short notes on: **(8)**

(i) TEU factor (ii) Orientation of approach channel with respect to wave direction.

SECTION – B

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

5. (a) What is a harbour? Draw a classification tree of different types of harbour. **(10)**

(b) What is a port? Draw a classification tree of different types of port. **(10)**

(c) What are the fundamental differences between a harbour and a port? **(10)**

(d) What kind of port is the Chittagong Port of Bangladesh? Justify your opinion logically. **(5)**

6. (a) Discuss in detail how the best location of a harbour is determined. **(15)**

(b) What are the fundamental differences between Pierhead line and Channel line? **(5)**

(c) Let us assume that you are working as an engineer in the Chittagong Port of Bangladesh. You are given the responsibility of leading a team for maintaining adequate water depth by dredging in the port area. Now, based on your responsibility, provide your opinion on the following: **(15)**

(i) What are the items of work required for a thorough site investigation?
(ii) What are the ground examination types?
(iii) What are the risks, if the site investigation is not thorough?

7. (a) State Stevenson's formula for determining wave height inside a harbour. Draw a figure showing the parameters stated in the equation. **(10)**

(b) Using Stevenson's formula determine the wave height at a point which is located 100 ft inside from the harbour entrance. The breadth of the harbour at the point of interest is 15 times larger than the breadth of the harbour at the entrance. Consider the average wave height at the entrance as 5.7 feet. **(10)**

(c) Write a note on rock mound breakwater. **(15)**

8. (a) What are the advantages and disadvantages of vertical-type breakwater over sloping type breakwater? **(15)**

(b) Define the following (draw necessary figures wherever required): **(4×5=20)**

(i) Quay (ii) Quay wall (iii) Pier (iv) Dolphins (v) Dock.

NAME 335 =3=

Width component	Condition	Width (m)
Basic width (W_{BM})	1.25 D < d < 1.5 D	1.6 B
	d < 1.25 D	1.7 B
Additional width (W_i)		
▪ prevailing cross-winds	15 - 33 kn	0.4 B
	33 - 48 kn	0.8 B
▪ prevailing cross-current	0.2 - 0.5 kn	0.2 B
	0.5 - 1.5 kn	0.7 B
	1.5 - 2.0 kn	1.0 B
▪ prevailing long current	1.5 - 3 kn	0.1 B
	> 3 kn	0.2 B
▪ prevailing wave height	1 - 3 m	1.0 B
	> 3 m	2.2 B
▪ aids to navigation	VTS	0
	good	0.1 B
▪ seabed characteristics	soft	0.1 B
	hard	0.2 B
▪ cargo hazard	medium	0.5 B
	high	1.0 B
▪ separation distance (W_P)	8 - 12 kn	1.6 B
	5 - 8 kn	1.2 B
▪ bank clearance (W_B)	sloping edge	0.5 B
	steep, hard embankment	1.0 B

Table for Q.No. 1(b)

L-3/T-1/NAME **Date : 24/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2015-2016

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

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

The symbols have their usual meaning. Assume reasonable value in case of missing data.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) For an octagonal pipe shown in Figure for Q. No. 1(a), explain how you are going to model the problem and apply boundary condition. **(20)**

   (b) A CST element is shown in Figure for Q. No. 1(b). The element is subjected to a body force $f_x = x^2$ N/m^3. Determine the nodal force vector. Take element thickness = 1 m. **(15)**

2. For the beam shown in Figure for Q. No. 2, determine the nodal displacements and slopes, the forces in each element and the reactions. **(35)**

3. For CST element

   (a) Derive shape functions. **(15)**

   (b) Evaluate the stiffness matrix for the element shown in Figure for Q. No. 3(b). The co-ordinates are given in units of millimeters. Assume plane stress conditions. Let E = 210 GPa, $\nu = 0.25$ and t = 10 mm. **(20)**

4. For the element shown in Figure for Q. No. 4, assume plane stress conditions with $E = 30 \times 10^6$ psi, $\nu = 0.3$ and displacements: **(35)**

   $u_1 = 0,\ v_1 = 0$

   $u_2 = 0.001$ inch, $v_2 = 0.0015$ inch

   $u_3 = 0.003$ inch, $v_3 = 0.0016$ inch

   $u_4 = 0$ and $v_4 = 0$

   Evaluate the stresses σ_x, σ_y and τ_{xy} at $\xi = 0$, $\eta = 0$.

Contd P/2

NAME 371

SECTION – B

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

5. (a) "Use of linear shape functions for bar element results in a constant strain within the element" – justify this statement by detailed mathematical explanation. **(20)**

   (b) For the vertical rod shown in Fig. for Q. No. 5(b), find the deflection at A and the stress distribution due to its self weight. Use E = 100 MPa and weight per unit volume = 0.06 N/cm^3. **(15)**

6. (a) Derive the generalized stress-strain relationship for a three-dimensional isotropic homogeneous body. Hence, obtain the expressions of stress-strain relationship for plane stress and plane strain. **(20)**

   (b) A steel rod is attached to rigid walls at each end and is subjected to a distributed load T(x) as shown in Fig. for Q. No. 6(b). Write the expression for potential energy and determine the displacement u(x) using the Rayleigh-Ritz method. Assume a displacement field $u(x) = a_0 + a_1x + a_2x^2$. **(15)**

7. (a) What is Von Mises stress? State and explain the principle of minimum potential energy. **(15)**

   (b) Consider the structure shown in Fig. for Q. No. 7(b). A rigid bar of negligible mass, pinned at one end, is supported by a steel rod and an aluminum rod. A load $P = 30 \times 10^3$ N is applied as shown. **(20)**

   (i) Model the structure using two finite elements. What are the boundary conditions for your model?

   (ii) Develop the modified stiffness matrix and modified load vector.

8. (a) Derive the expression of the transformation matrix for plane truss and hence, describe how to find out the element stiffness matrix in the global co-ordinate system. **(20)**

   (b) A spring system is shown in Fig. for Q. No. 8(b). Determine the global stiffness matrix for the entire configuration. Also calculate the support reactions. **(15)**

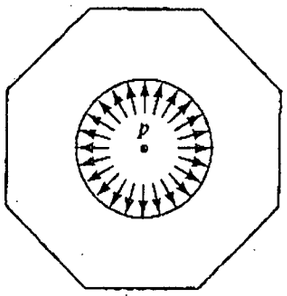


Figure for Q. No. 1(a)

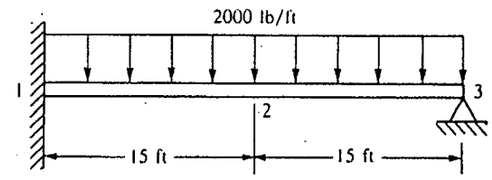


Figure for Q. No. 2

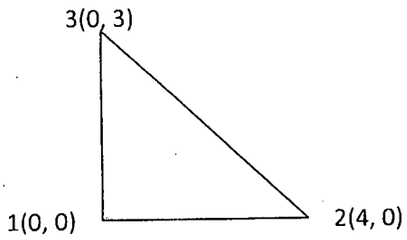


Figure for Q. No. 1(b)

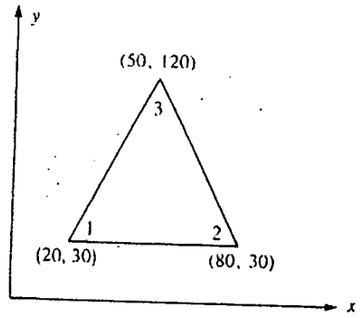


Figure for Q. No. 3(b)

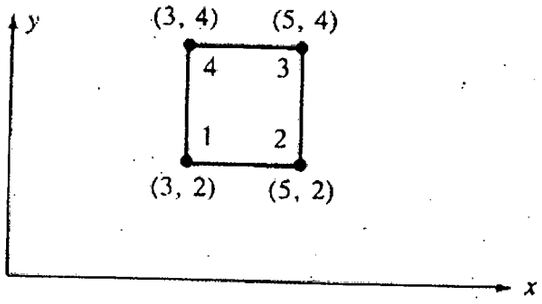


Figure for Q. No. 4

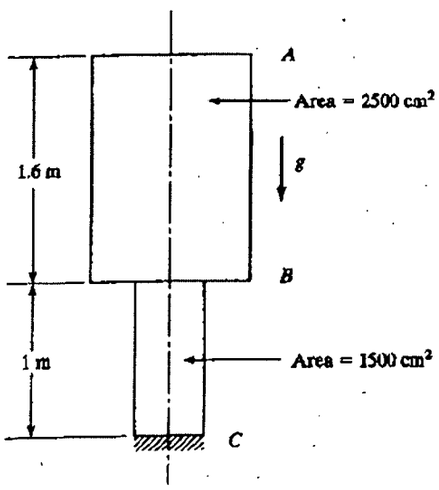


Fig. for Q. No. 5(b)

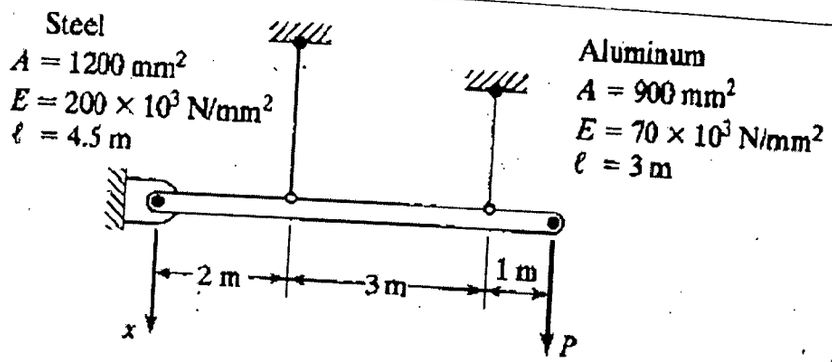
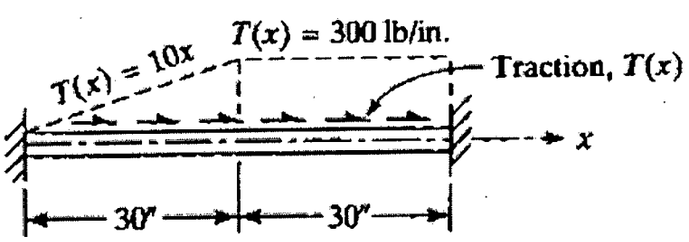
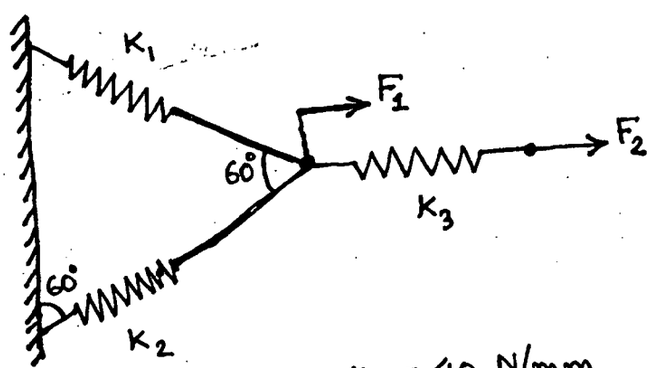


Fig. for Q. No. 7(b)



$E = 30 \times 10^6$ psi $A = 2$ in.^{2}

Fig. for Q. No. 6(b)



$K_1 = 40$ N/mm

$K_2 = 50$ N/mm

$K_3 = 80$ N/mm

$F_1 = 60$ N

$F_2 = 50$ N

Fig. for Q. No. 8(b)

L-3/T-1/NAME **Date : 29/01/2017**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2015-2016

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) What factors would you select to show that welding is better than bolting or riveting in ship building industry? **(12)**

   (b) How would you use the triangle of combustion to illustrate the basic principle of Oxyacetylene welding? **(15)**

   (c) Can you identify the different parts of welding torch for gas welding? With neat sketch show the general view and cross-section of a torch. **(8)**

2. (a) Select a NDT method that will work better to detect surface and sub-surface flaws for both ferromagnetic and nonferromagnetic metals. Justify your selection with examples. **(15)**

   (b) How would you solve the problem of expanding and contracting of metals after welding? **(10)**

   (e) With neat sketch show the different parts of Fillet and Groove Weld. **(10)**

3. (a) What conclusions can you draw for Forehand and Backhand welding technique? **(12)**

   (b) With simplified diagram show the basic processes in Spot, Seam and Projection welding. **(12)**

   (c) Can you predict the outcome if strongly carburizing flame is used in cutting low-carbon steels? Suggest proper oxyacetylene flame for cutting those steels. **(11)**

4. (a) What are the causes of backfires and flashbacks? How they can be avoided? **(15)**

   (b) Explain the following symbols of electrode specification according to AWS for Shielded Metal Arch Welding process: **(5)**

   E 7747 – C2L

   (c) Sketch how the welds would appear as specified by the symbols in Fig. for Q. 4(c). Use a cross sectional view if needed. **(15)**

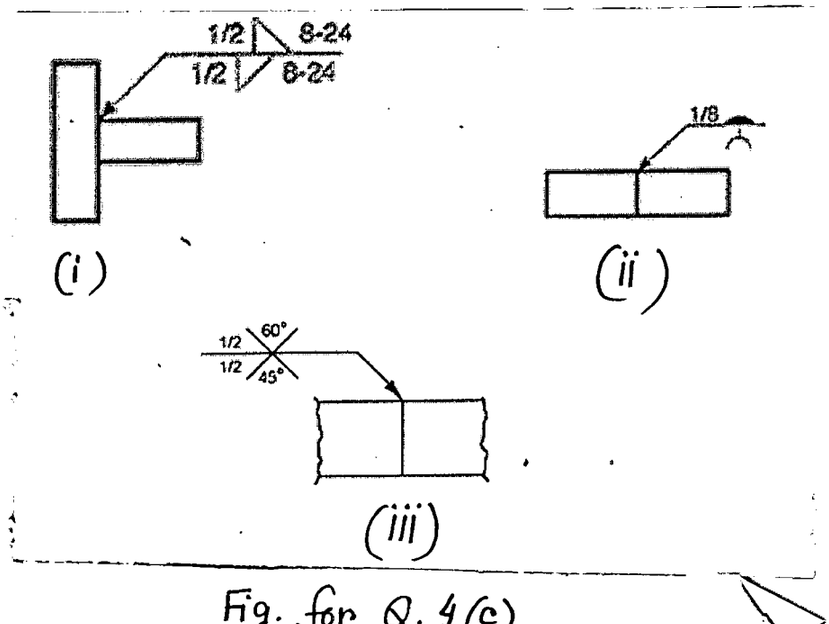


Fig. for Q. 4(c)

Contd P/2

NAME 345

SECTION – B

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

Symbols have their usual meaning. Reasonable value of any missing data can be assumed.

5. (a) Discuss GMAW process with figure. **(15)**

   (b) Write short notes on: **(20)**

   (i) Axial spray transfer

   (ii) Short-circuit metal transfer

   (iii) HAZ

   (iv) Arc length

6. (a) What is underwater welding? What are the types of underwater welding? Write down the advantages and disadvantages of different types of underwater welding. **(20)**

   (b) Discuss judging quality of an oxygas cut with figures. **(15)**

7. (a) What is stick welding? Draw the schematic diagram at stick welding. Discuss different parts of cutting torch. **(20)**

   (b) Write short notes on: **(15)**

   (i) Flux-cored arc welding

   (ii) Submerged arc welding

   (iii) Reverse polarity

8. (a) Write down the different types of defect and discontinuity found in welding. Mention the causes and remedies for the following welding defects: **(20)**

   (i) Inclusion

   (ii) Under flush

   (iii) Arc whiskers

   (iv) Throat crack

   (b) Discuss the importance of surface preparation. Write short notes on: **(15)**

   (i) Rubber pellet blasting

   (ii) Wet blasting (hydro blasting)

L-3/T-1/NAME Date : 04/02/2017

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2015-2016

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. Assume reasonable value for any missing data.

1. (a) Describe Froude's contribution for determination of frictional resistance. **(10)**

   (b) Explain form factor approach for model-ship extrapolation. **(12)**

   (c) The principal particulars and model experimental results of a model is given below: **(13)**

   Length between perpendiculars = 6 m

   Wetted surface area = 4.2 m^2

   Model speed = 4 m/s

   Model resistance = 220 N

   Tank water density = 997.52 kg/m^3

   Tank water kinematic viscosity = 1.0111×10^{-6} m^2/s

   Calculate the frictional resistance using ATTC (Schoenherr) formulation.

2. (a) Describe salient features of Kelvin wave pattern. **(15)**

   (b) Deduce a relationship between wave-making resistance and speed of a ship and make comments on the interference effect. **(20)**

3. (a) Define ship trial and service conditions. **(15)**

   (b) The trial data and model experimental results of a ship are provided below: **(20)**

Run No.	1–3	4–6
Ship power from ship trial (kW)	5900	8920
Mean speed (Knot)	18.5	20.5
Propulsive coefficient from model test	0.76	0.73
Residuary resistance co-efficient	0.807×10^{-3}	1.009×10^{-3}

   Ship length = 160 m

   Ship wetted surface area = 4290 m^2

   Density of sea water = 1025 kg/m^2

   Kinematic viscosity of sea water = 1.28×10^{-6} m^2/s

   Calculate the model-ship correlation allowance, C_A and also estimate the ship trial and service power assuming service allowance, $1 + C_2 = 1.27$.

Contd P/2

NAME 323

4. (a) Explain how the wave-making resistance of a ship can be reduced. **(8)**

   (b) Describe circular (P) theory. **(7)**

   (c) Explain how statistical method can be used for ship resistance and power estimation. **(20)**

SECTION – B

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

Symbols have their usual meaning. Reasonable value can be assumed for any missing data.

5. (a) Describe the Blade element theory of propeller action and derive the expression for elemental thrust, torque and efficiency considering induced velocities. **(20)**

   (b) A four bladed propeller of diameter 3.25 m and constant pitch ratio 1.0 has a speed of advance of 4.5 m/s when running at 125 r.p.m. The blade section at 0.7 R has a chord of 0.5 m a no-lift angle of 2 degrees, a lift-drag ratio of 25 and a lift coefficient that increases at the rate of 5 per radian. The axial and rotational inflow factors are 0.2 and 0.025 respectively. Calculate the thrust, torque and efficiency of the blade element at 0.7 R. **(15)**

6. (a) Derive the following relation which is the condition for minimum loss of energy in case of wake-adapted propeller suggested by BETZ. **(25)**

$$\text{Tan}\,\beta_i = \frac{1}{\eta_{p_i}}\left(\frac{1-\omega}{1-\omega'}\right)^{3/4} \cdot \text{Tan}\,\beta$$

   (b) Prove that the product of lift coefficient, C_L and chord length, C of a blade element can be expressed as, **(10)**

$$C \cdot C_L = \frac{4\pi D}{z} \cdot x \cdot k \cdot \text{Sin}\,\beta_i \cdot \tan(\beta_i - \beta)$$

   Here, k is the Goldstein correction factor.

7. (a) Discuss three methods by which propeller cavitation can be reduced or eliminated. **(15)**

   (b) A propeller is to be designed for a single screw cargo ship to give a service speed of 21 knots with an engine developing 9000 KW brake power at 100 r.p.m. **(20)**

   Using Burrill cavitation chart, determine

   (i) total thrust developed

   (ii) total projected area of the blades

   (iii) total developed area of the blades.

   (iv) blade-area ratio for suggested upper limit (in order to avoid serious back cavitation) for merchant slip propeller.

Contd P/3

NAME 323

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

In below given necessary particulars which are required by the design.

Taylor wake fraction = 0.2

Diameter of the propeller = 6.15 m

Pitch of the propeller = 7 m

Shaft immersion = 4.2 m

Propeller efficiency = 0.73

Relative rotative efficiency = 1.03

Density of sea water = 1025 kg/m^3

8. (a) A three bladed propeller of 3 m diameter has a thrust of 350 kN and a torque of 300 kN.m. The thrust and torque are uniformly distributed between the root section at x = 0.2 and tip section at x = 1.0. **(15)**

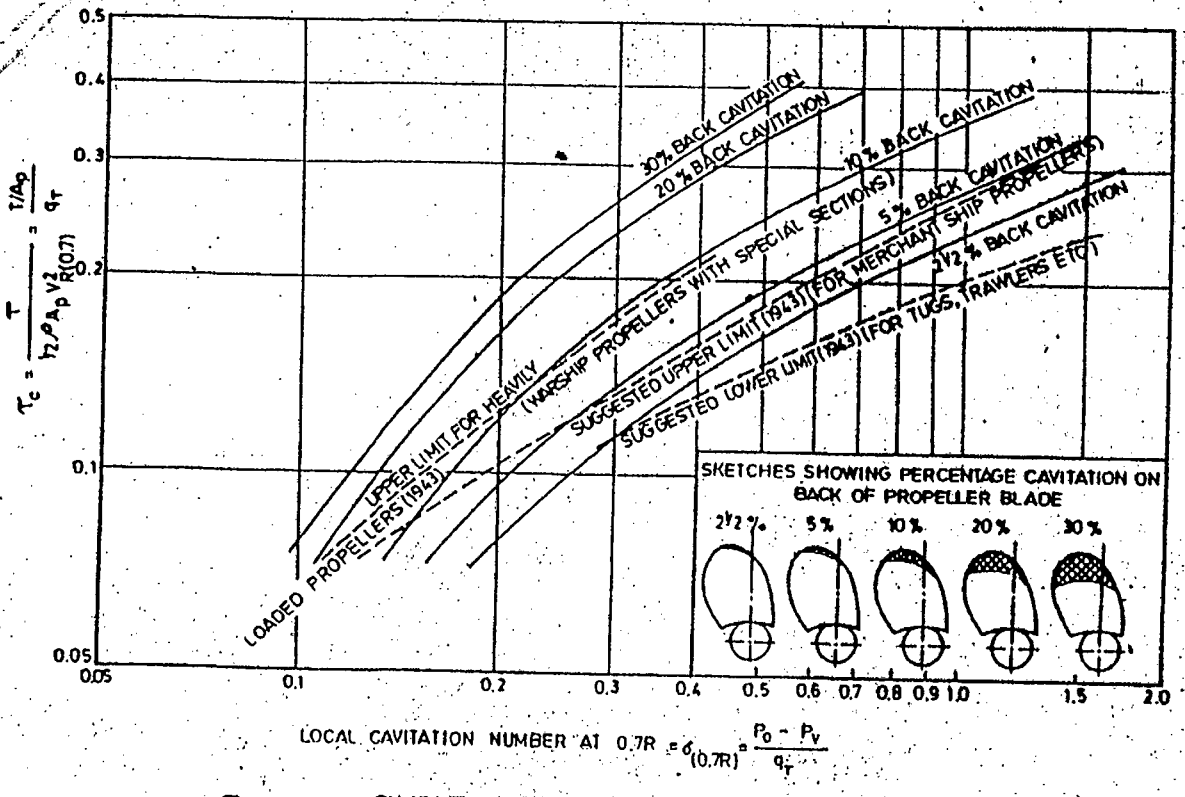
Calculate the bending moments due to thrust and torque in the root section.

(b) The areas of blade section at various radii of a propeller of 3 m diameter are as follows: **(20)**

r/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	0.0843	0.0807	0.0691	0.0538	0.0358	0.0168	0.0000

The propeller runs at 170 r.p.m. 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 0.2 R. If the centroid of the section is at distances of 0.15 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.



BURRILL SIMPLE CAVITATION DIAGRAM

Thrust coefficient, $\tau_c = \frac{\text{Thrust per sq. meter } (KN/m^2)}{\text{Dynamic Pressure } (KPa)} = \frac{T/A_P}{q_T}$

Cavitation number, $\sigma = \frac{p_o - p_v}{q_T}$

$p_o - p_v = 99.66 + 10.18h$ (KPa)

h = shaft immersion, (m)

$q_T = \frac{1}{2}\rho V^2_{.7R}$ = dynamic pressure (KPa)

$V_{.7R}$ = resultant velocity at 0.7 radius, (m/s) $= \sqrt{V_a^2 + (\omega r_{.7})^2}$

ρ = density (kg/m^3)

T = Thrust (N)

A_P = Projected blade area (m^2).

NAME 323

Fig. for Qn. no. 7(b)