L-2/T-1/WRE **Date : 07/01/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2011-2012

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) Explain the statement "Accounting as an Information System". **(3)**

   (b) What are the differences between Financial Accounting and Managerial Accounting? **(3)**

   (c) Mr. Khan and his associates started their manufacturing business on July 1, 2012. The following transactions took place during the first month of operation: **(17 ⅓)**

   July 1 : Invested Tk. 40,000 in cash to start business.
   July 7 : Purchased office equipment in cash Tk. 20,000.
   July 10 : Hired a managing director to manage the business efficiently. He will be paid to salary Tk. 20,000 per month.
   July 18 : Incurred advertising expense on account as Tk. 5,000.
   July 20 : Incurred office rent in advanced as Tk 10,000.
   July 21 : Earned Tk. 30,000 for selling the products: Tk. 10,000 is received in cash and remaining on account.
   July 23 : Withdrawn by Mr. Khan for his personal use as Tk. 5,000.
   July 25 : Paid the amount due related to advertising expense.
   July 27 : Received cash from previous customer on transaction July 21.
   July 31 : Employee's salaries expense was due for Tk. 4,000.
   July 31 : Utilities expense incurred Tk. 4,500.
   July 31 : Death of manager caused loss to the business. Value of loss may be Tk. 10,000.

   Requirement:

   Provide journal entries for above transactions.

2. (a) What is trial balance? Describe the advantages and disadvantages of trial balance. **(3)**

   (b) State in brief four assumptions and principles to provide financial information with examples. **(3 ⅓)**

   (c) Omar Sadi started a business on August 1, 2012. The following transactions took place during the first month of operation: **(17)**

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August 1 : Omar Sadi invested Tk. 50,000 cash in the business.

August 5 : Purchased furniture costing Tk. 30,000. A cash payment of Tk. 10,000 was made immediately, the remaining will be paid on Notes payable.

August 13 : Purchased office supplies for Tk. 500 in cash.

August 18 : Products sold to the customers as valued Tk. 20,000 of which Tk. 8,000 cash received and remaining on account.

August 21 : Paid to the suppliers amount due on transaction August 5.

August 25 : Received Tk. 3000 from previous customer.

August 26 : Withdrawn Tk. 200 for personal use.

August 27 : Paid utilities expense Tk. 300.

August 28 : Paid rent expense Tk. 400.

August 31 : Monthly salaries expense due Tk. 3,000.

Requirements:

Prepare a tabular analysis of the August transactions according to accounting equation.

3. Sun-Beam Company Ltd. is owned by Mr. Sharif. The company prepare financial statements in every year. The trial balance at the end of 31st December 2011 is given below: **(23 1/3)**

	Debit (Tk.)	Credit (Tk.)
Cash	5000	---
Prepaid insurance	6000	---
Office equipment	60,000	---
Accumulated Depreciation – Office equipment	---	9,000
Accounts Payable	---	2,500
Unearned Service Revenue	---	6,400
Mortgage Payable	---	30,000
Capital Mr. Sharif	---	10,000
Service Revenue	---	15,100
Rental Income	---	7,000
Salaries Expense	9,000	---
Drawing Mr. Sharif	5,000	---
Income Tax Payable	---	5,000
Total	85,000	85,000

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Adjustments:

(i) Prepaid insurance expired Tk. 4,000.

(ii) The mortgage interest rate is 10% per annum. Mortgage was taken on July 1, 2011.

(iii) Half of the unearned service revenue earned during this period.

(iv) Office equipment was depreciated Tk. 300 per month.

(v) Salaries accrued but not paid Tk. 1,700.

(vi) Income tax expense accrued Tk. 2,000.

Requirements:

(a) Prepare the necessary adjusting entries.

(b) Prepare adjusted trial balance on 31st December 2011.

4. Mr. Panvoom started his business at January 1, 2011. The trial balance at 31st December was as: **(23 1/3)**

	Debit (Tk.)	Credit (Tk.)
Cash	20,500	---
Accounts Receivable	15,000	---
Accounts Payable	---	12,000
Mortgage Payable	---	3,700
Merchandise inventory (01.01.11)	5,800	---
Purchase	20,100	---
Sales Revenue	---	40,500
Sales Return and allowance	1,200	---
Purchase discount	---	500
Mr. Panvoom's capital	---	36,200
Drawings	2,300	---
Salaries	3,400	---
Prepaid Insurance	3,600	---
Motor Van	16,000	---
Rent Expense	5,000	---
Total	92,600	92,600

Adjustments:

(i) Merchandise inventory (31.12.2011) is Tk. 6,700.

(ii) Insurance expires 50% during the period.

(iii) The motor van is depreciated Tk. 150 per month.

(iv) 10% of accounts receivable is to be bed debt.

(v) Salary to an employee is accrued Tk. 600.

(vi) Rent is 40% administrative and 60% selling expense.

Required:

(a) Prepare multiple income statement.

(b) Prepare Statement of Owners Equity and a balance sheet statement as on 31st December, 2011.

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SECTION – B

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

5. (a) What do you understand by mixed cost and cost formula? **(4 ⅓)**

(b) Speedy Parcel Service operates a fleet of delivery trucks in a large metropolitan area. A careful study by the company's cost analyst has determined that if a 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 mile. **(14)**

Required:

(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 of 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 disadvantage of high-low point method?

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

Total Costs (Tk.)	Hours of Operating Time			
	5,000	10,000	15,000	20,000
Variable	20,000	?	?	?
Fixed	180,000	?	?	?
Total	200,000	?	?	?
Cost per hour (Tk.):				
Variable	?	?	?	?
Fixed	?	?	?	?
Total Cost per hour	?	?	?	?

Required:

Compute the missing amounts, assuming that implied cost behaviour patterns remain unchanged over the relevant range of 5,000 to 20,000 hours.

6. (a) What is Break-Even Point? What information can you depict from a contribution break-even chart? **(4 ⅓)**

(b) Crown Creative Inc. makes high quality Personal Digital Assistant (PDA). Sales and production data relating to the most recent year are given below: **(19)**

Sales (in unit)	2,800
Selling price per unit (Tk.)	265
Contribution margin ratio	60%
Annual Fixed costs (Tk.)	111,300

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

Requirements:

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

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

(iii) 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?

(iv) 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 would cause annual sales in units to increase by 40%. Would you recommend that the company should do as the sales manager suggests?

(v) • Compute degree of operating leverage at the present level of sales.

• 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.

• Verify your answer by preparing income statement.

7. (a) What is the basic difference between variable costing and absorption costing? **(4 1/3)**

(b) For the income year ended on December 31, 2010; you have been given the information below: **(19)**

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

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

(iii) Reconcile the amount of net income under these two techniques.

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8. (a) Name the three types of inventories that appear on a manufacturer's balance sheet. Define each of them with an example. **(3 ⅓)**

(b) The following cost data are taken from the accounting records of Excell Company: **(13)**

	Tk.		Tk.
Advertising cost	100,000	Utilities, factory	9,000
Direct labour cost	90,000	Utilities, office	5,000
Purchase of raw materials	132,000	Maintenance, factory equipment	24,000
Rent, factory	80,000		
Rent office	20,000	Supplies, factory	700
Indirect labour	56,300	Supplies, office	500
Sales commission	35,000	Depreciation, factory equipment	40,000
Administrative manager's salary	30,000	Depreciation, office equipment	8,000
Salesman's salary	8,000	Depreciation, showroom equipment	2,000
Director's salary	40,000	Power and electricity	2,500
Supervisor's salary	12,000	Fuel for factory equipment	700
Rent, showroom	30,000	Gas and water, factory	900
Legal fees	15,000	Insurance, factory	12,000
Carriage outwards	6,000		
Carriage inwards	7,000		

Required:

List down the expenses under the following headings and calculate the total:

(i) Manufacturing overhead; (ii) Administrative overhead; (iii) Selling and distribution overhead.

(c) Various costs associated with the operation of factories are given below: **(7)**

(i) Electricity used in operating machines;

(ii) Rent on a factory building;

(iii) Wages of labourers assembling a product;

(iv) Depreciation of air purification equipment used in furniture production;

(v) Peaches used in canning fruit;

(vi) Sugar used in soft-drink production;

(vii) Property taxes on the factory;

(viii) Wages of workers painting a product;

(ix) Cost of a hard drive installed in a computer;

(x) Wages of the company's accountant.

Required:

Indicate whether each cost would typically be treated as direct cost or an indirect cost with respect to units of product.

L-2/T-1/WRE **Date : 17/12/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 291** (Engineering Materials)

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 principle types of interatomic bonds? Give examples and characteristic property of different types of interatomic bonds. **(5+5+5=15)**

   (b) Explain the general equation representing the bonding force F(r) between two atoms. Determine equilibrium spacing (r_o) between two atoms from the expression of the bonding force (F(r)). **(5+5=10)**

   (c) Define Bond Energy. Derive an expression of potential energy between two atoms from the expression of bonding force F(r). **(3+7=10)**

2. (a) What is gradation of aggregate? Explain why grading of aggregates is an important factor. Why 'Blending' of aggregates is necessary? **(3+4+4=11)**

   (b) Define F.M. Determine F.M. of an aggregate with the following sieve analysis data: **(3+5=8)**

Sieve Designation	Material Retained (gm)
3/8″	0
# 4	3.6
# 8	7.4
# 10	11.3
# 16	13.7
# 30	31.5
# 40	24.8
#50	7.6
# 100	4.5
# 200	3.2
Pan	2.7

   (c) Qualitatively draw gradation curves for the following types of aggregate: (i) Uniform graded, (ii) Well graded, (iii) Gap graded. **(2+2+2=6)**

   (d) How does (i) water/cement ratio, (ii) grading of aggregate, (iii) maximum size of aggregate, and (iv) moisture content of aggregate affect the properties of concrete? **(2.5×4=10)**

3. (a) Define segregation and bleeding in concrete. Discuss the causes and available remedies for segregation and bleeding in concrete. **(4+8=12)**

   (b) What is workability of concrete? How can you measure workability of concrete in the site? Mention the general rules for placing of concrete. **(2+3+3=8)**

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Contd ... Q. No. 3

(c) Design the mix of concrete for the mean strength of 3000 psi at 28 days. Find out the amount of different ingredients at the SSD condition and also at the laboratory condition on weight basis. Use ACI 211.1 method. Material properties are given below and the necessary tables are attached at ANNEXURE-1 and ANNEXURE-2. Assume reasonable value for any missing data. **(15)**

Concrete:
Mean Strength: 3,500 psi
Slump: 30-50 mm

Coarse Aggregate:
Maximum size: 40 mm
Absorption capacity: 1.8%
Moisture content in the laboratory: 1%
Bulk specific gravity (OD): 2.62
Dry rodded unit weight: 1620 kg/m^3

Cement Type:
Ordinary Portland Cement (OPC)
Specific gravity: 3.15

Fine Aggregate:
Fineness Modulus: 2.50
Absorption capacity: 1.8%
Moisture content in the laboratory: 4%
Bulk specific gravity (OD): 2.67

4. (a) Draw the cross section of a tree trunk and describe each element. **(10)**

   (b) Write short note on: **(7)**

   (i) Soundness of cement.

   (ii) Chemical composition of cement.

   (c) What are the types of lime? Discuss each type briefly. **(8)**

   (d) Differentiate between pit sand and river sand. What is bulking of sand? How it effects change in volume of sand? **(10)**

SECTION – B

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

Assume any reasonable value, if needed.

5. (a) Write down the functions of major constituents of typical Portland cement during hydration reaction. Briefly describe different reason stages involved in hydration process of Portland cement and also draw the calorimetric curve of Portland cement. **(7+7=14)**

   (b) A brick sample is tested in the laboratory for determination of unit weight. A dry unit weight of 115 lb/ft^3 is obtained using the following information: **(6)**

   Density of water = 62.4 lb/ft^3

   Amount of wax required to cover the brick sample = 0.52 lb

   Weight of wax coated brick in air = 3.65 lb

   Weight of wax coated brick in water = 1.45 lb

   Determine the specific gravity of wax at test temperature.

Contd P/3

CE 291

Contd ... Q. No. 5

(c) Compare between different types of mortar used in structural works. **(9)**

(d) Describe different methods of slaking lime. **(6)**

6. (a) What are the effects of knots and pitch pocket on mechanical properties of structural wood? Describe heat capacity and thermal diffusivity of wood. **(6+7=13)**

(b) Describe the operational processes involved in brick manufacturing in different chambers of a Hoffman's kiln. **(10)**

(c) What is hydraulicity of lime? What are the factors that are responsible for hydraulicity of lime? **(6)**

(d) Compare Portland cement and lime as construction materials in civil engineering works. **(6)**

7. (a) What are the properties of good sand? What are the types of gradation of sand? **(4+3=7)**

(b) What is blended cement? Discuss composition and applicability (i) Fly Ash Pozzolanic and ~~100~~ 10 Blast Furnace Slag blended cement. Draw the flow diagram of 'wet process' of cement manufacturing. **(2+7+5=14)**

(c) Write short note on (i) internal friction of timber and (ii) water ponding. **(4+3=7)**

(d) What are the field tests of brick? What is the effect of presence of alkalies in brick? **(4+3=7)**

8. (a) A structural lumber is being tested for determination of moisture content and density and following information are obtained: M_{sink} = 73.8%; $G_{cell\ wall}$ =1.538. Determine maximum possible moisture content and density of the wood (lb/ft^3) at 23% moisture content. Also determine the specific gravity of wood at 15% moisture content. **(8)**

(b) Differentiate between normal air-entraining cement and moderate Sulphate resistance cement. Draw a diagram showing the effect of Adiabatic temperature rise in mass concrete for different types of Portland cement. **(5+5=10)**

(c) What are the characteristics of good bricks? Write down the function of the following chemical constituents in brick (i) Alumina and (ii) Silica. **(5+5=10)**

(d) What precautions should be taken for the storage of cement on works? Write down some Cement Mortar Mix Proportions typically used in constructions works. **(4+3=7)**

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L-2/T-1/WRE

Date : 19/11/2012

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 221** (Mechanics of Solids - I)

Full Marks: 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

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

Assume reasonable value (values) for missing data only.

1. (a) Draw the shear force and bending moment diagram for the beam loaded as shown in Fig. 1. **(15)**

   (b) Draw the shear force and bending moment diagram for the beam loaded as shown in Fig. 2. **(20)**

2. (a) The beam shown in Fig. 3 has a cross-sectional area in the shape of a channel. Determine the maximum bending stress that occurs in the beam. **(20)**

   (b) Prove that total shear carried by the web of a thin-walled I-section is equal to the applied shear force, V i.e. $F_w = V$. **(15)**

3. (a) The thin-walled box beam shown in Fig. 4 is subjected to shear of 30 kips. Determine the variation of the shear flow throughout the cross section. **(20)**

   (b) Determine the location of the shear center for the thin-walled channel section having the dimensions shown in Fig. 5. **(15)**

4. (a) A simply supported beam shown in Fig. 6 is made from two boards. Determine the maximum shear stress in the glue necessary to hold the boards together along the seam where they are joined. **(20)**

   (b) A 25-ft long cylindrical tank is to be made of 0.5 inch thick steel. If it is subjected to an internal pressure of p = 200 psi, determine its outer radius if the maximum normal stress is not to exceed 15 ksi. **(15)**

SECTION – B

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

5. (a) The pole shown in Fig. 7 is supported by a pin at C and an A-36 steel guy wire AB. If the wire has a diameter of 0.2 in, determine how much it stretches when a horizontal force of 250 lb acts on the pole. For A36 steel E_{st} = 29000 ksi. **(15)**

Contd P/2

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Contd Q. No. 5

(b) The load is supported by the four 304 stainless steel wires that are connected to the rigid members AB and DC (Fig. 8). Determine the angle of tilt of each member after the 500 lb load is applied. The members were originally horizontal and each wire has a cross-sectional area of 0.025 in^2. For 304 stainless steel, $E_{st} = 28 \times 10^6$ psi. **(20)**

6. (a) The solid aluminum shaft has a diameter of 50 mm. Determine the absolute maximum shear stress in the shaft and sketch the shear-stress distribution along a radial line of the shaft where the shear stress is maximum. The shaft is shown in Fig. 9. **(10)**

(b) A solid tapered steel shaft is rigidly fastened to a fixed support at one end and is subjected to a torque of 27 k. in at the free end as shown in Fig. 10. The diameter at fixed end is 6 in and at the free end is 2 in. The length of the shaft is 20 in. Determine the angular rotation of the free end if $G = 12 \times 10^6$ psi. **(15)**

(c) A shaft is made of a steel alloy having an allowable shear stress of $\tau_{allow} = 12$ ksi. If the diameter of the shaft is 1.5 in, determine the maximum torque T that can be transmitted. What would be the maximum torque T′ if a 1 in diameter hole is bored through the shaft. **(10)**

7. (a) A beam is subjected to the loading as shown in Fig. 11. Determine its required cross-sectional dimension 'a', if the allowable bending stress for the material is $\sigma_{allow} = 150$ MPa. **(15)**

(b) Determine the maximum uniform distributed load w_0 that can be supported by the reinforced concrete beam if the allowable tensile stress for the steel is $(\sigma_{st})_{allow} = 28$ ksi and the allowable compressive stress for the concrete is $(\sigma_{conc})_{allow} = 3$ ksi. Assume the concrete cannot support a tensile stress. Given, $E_{st} = 29000$ ksi and $E_{conc} = 3.6 \times 10^3$ ksi. The beam is shown in Fig. 12. **(20)**

8. (a) The two circular rod segments as shown in Fig. 13, one of aluminum and the other of copper, are fixed to the rigid walls such that there is a gap of 0.008″ between them when $T_1 = 60°F$. Each rod has a diameter of 1.25 in, $\alpha_{al} = 13 \times 10^{-6}/°F$, $E_{al} = 10 \times 10^3$ ksi, $\alpha_{cu} = 9.4 \times 10^{-6}/°F$, $E_{cu} = 18 \times 10^3$ ksi. Determine the average normal stress in each rod if $T_2 = 300°F$, and also calculate the new length of the aluminum segment. **(20)**

(b) For a given maximum shear stress, determine the factor by which the torque carrying capacity is increased if the half-circular section is reversed from the dashed-line position to the section shown in Fig. 14. The tube is 0.1 in thick. **(15)**

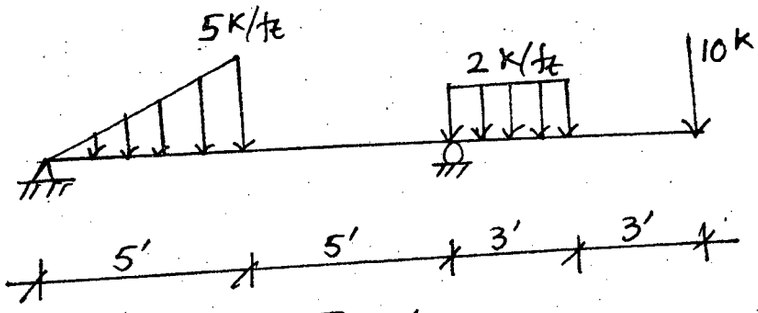


Fig. 1

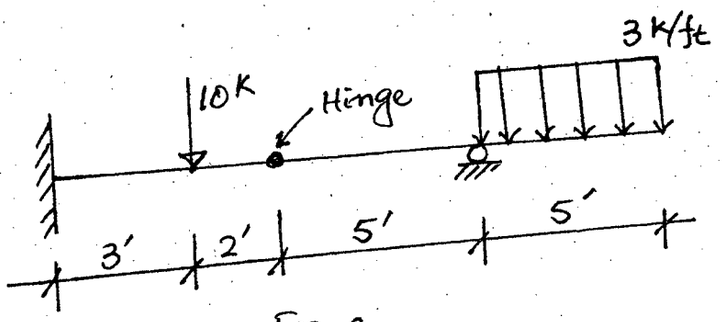


Fig. 2

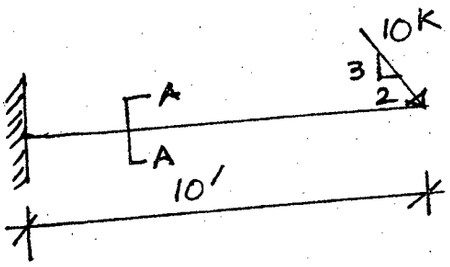
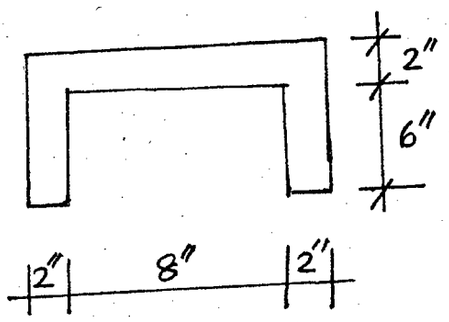


Fig. 3



Section A-A

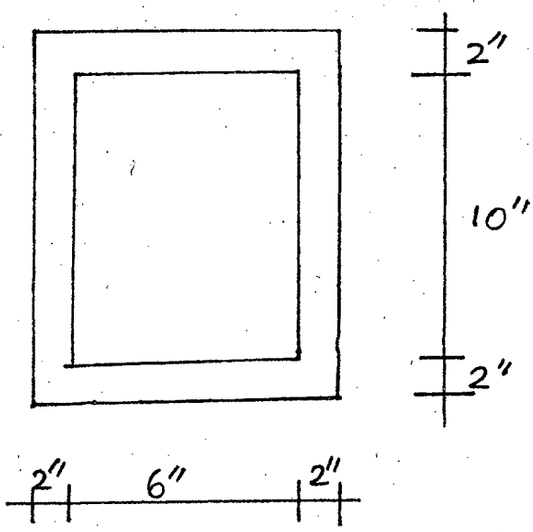


Fig. 4

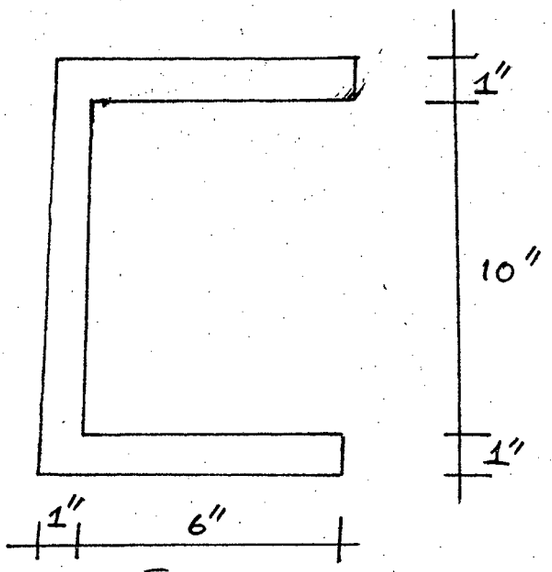


Fig. 5

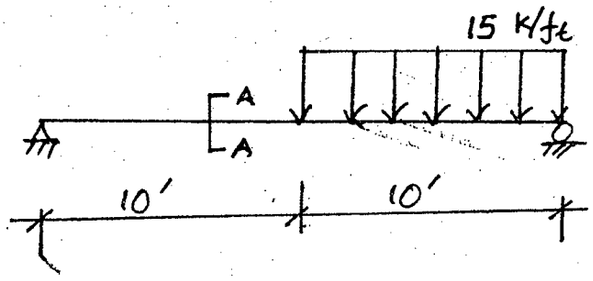
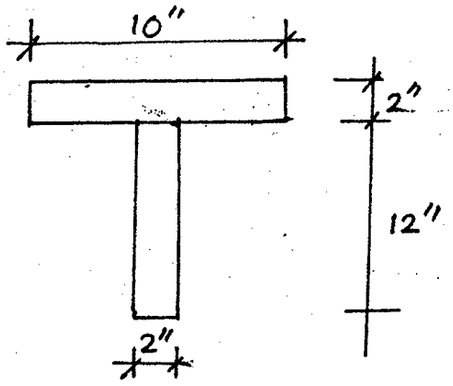


Fig. 6



Section A-A

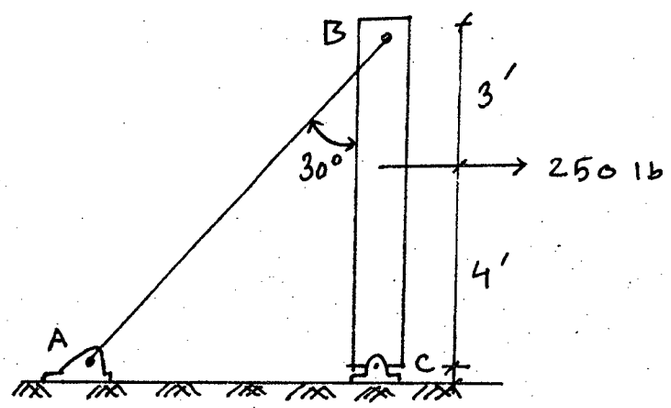


Fig. 7

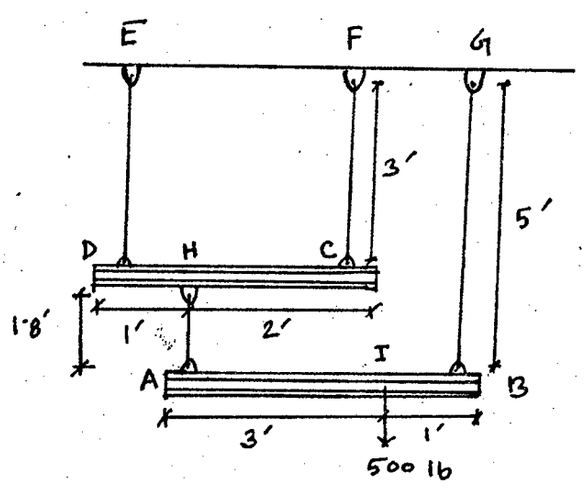


Fig. 8

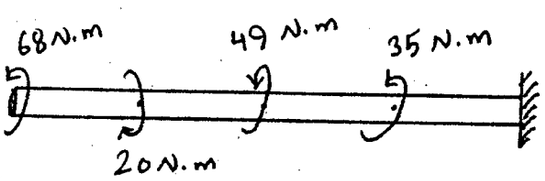


Fig. 9

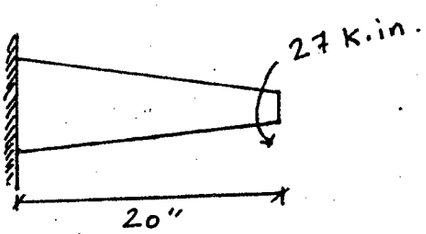


Fig. 10

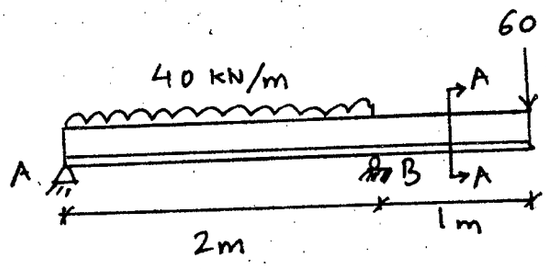


Fig. 11

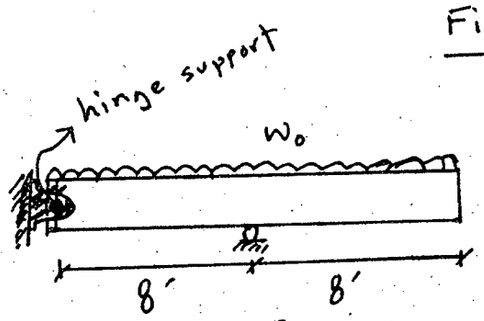
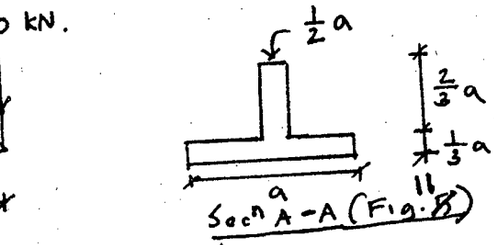


Fig. 12



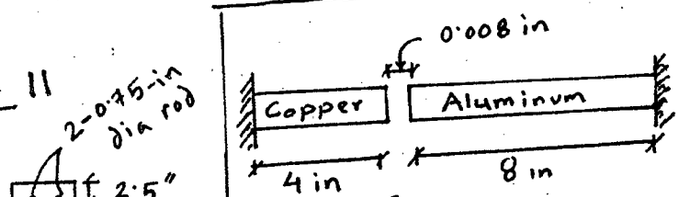


Fig. 13

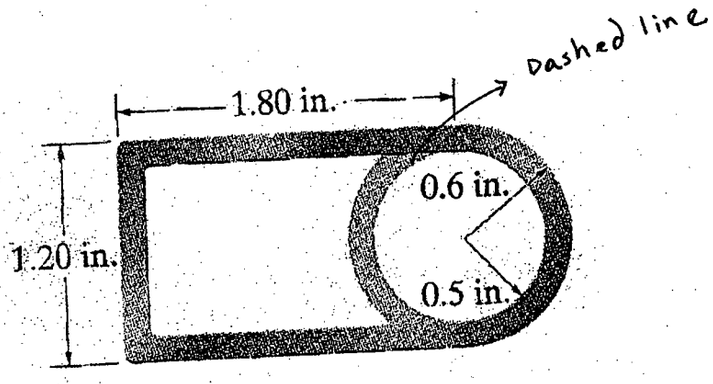


Fig. 14

Tanvir
24.12.12

L-2/T-1/WRE **Date : 24/12/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **MATH 231** (Differential Equations)

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 used have their usual meaning.

1. (a) Solve: $x\frac{dy}{dx} - 2y = x^2 + \sin\frac{1}{x^2}$. **(12)**

   (b) Solve: $\tan^2(x+y)dx - dy = 0$. **(11)**

   (c) Solve: $2xdy - 2ydx = \sqrt{x^2 + 4y^2}\,dx$. **(12)**

2. (a) What is exact differential equation? Solve: **(12)**

   $$(2xy^4e^y + 2xy^3 + y)dx + (x^2y^4e^y - x^2y^2 - 3x)dy = 0.$$

   (b) Solve: $\sec^2 y\frac{dy}{dx} + (\tan y)2x = x^3$. **(11)**

   (c) Solve: $(D^2 + 3D + 2)y = x^2 \cos x$. **(12)**

3. (a) If the population of a country doubles in 50 years, in how many years will it be treble under the assumption that the rate of increase is proportional to the number of inhabitants? **(11)**

   (b) Solve: $(x^3D^3 + 2x^2D^2)y = x + \sin \ln x$. **(12)**

   (c) Solve: $y = -px + x^4p^2$, where $p \equiv \frac{dy}{dx}$. **(12)**

4. Solve the following differential equation in series by Frobenius method

   $8x^2y'' + 10xy' + (x - 1)y = 0$. **(35)**

SECTION – B

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

5. (a) Form a PDE by eliminating the arbitrary function f from the equation $x + y + z = f(x^2 + y^2 + z^2)$. **(11)**

   (b) Solve the following PDEs:

   (i) $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$. **(12)**

   (ii) $z^2p^2y + 6zpxy + 2zqx^2 + 4x^2y = 0$. **(12)**

Contd P/2

MATH 231 (WRE)

6. (a) Find a complete integral of $2p_1x_1x_3 + 3p_2x_3^2 + p_2^2p_3 = 0$. **(10)**

(b) Solve (i) $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$ **(15)**

(ii) $(D^2 + DD' + D' - 1)z = \sin(x + 2y)$ *where* $D \equiv \frac{\partial}{\partial x}$, $D' \equiv \frac{\partial}{\partial y}$. **(10)**

7. (a) When n is a positive integer, prove that $J_n(x)$ is the coefficient of z^n in the expansion of $e^{\frac{x(z-\frac{1}{z})}{2}}$ in ascending and descending powers of z. Also prove that $J_n(x)$ is the coefficient of z^{-n} multiplied by $(-1)^n$ in the expansion of above expression. **(14)**

(b) Show that (i) $\frac{d}{dx}\left[xJ_n(x)J_{n+1}(x)\right] = x\left[J_n^2(x) - J_{n+1}^2(x)\right]$. **(11)**

(ii) Express $f(x) = 4x^3 + 6x^2 + 7x + 2$ in terms of Legendre polynomials. **(10)**

8. (a) Prove that $\int_{-1}^{1} xP_n(x)P_{n-1}(x)dx = \frac{2n}{4n^2 - 1}$. **(12)**

(b) Show that $P_n'(x) - xP_{n-1}'(x) = nP_{n-1}(x)$. **(12)**

(c) Show that $\int_0^{\pi/2} \sqrt{\pi x}\ \ J_{1/2}(2x)dx = 1$. **(11)**

Rasmia
31.12.12

L-2/T-1/WRE Date : 31/12/2012

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **WRE 203** (Engineering Geology and Geomorphology)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) Briefly describe the physical characteristics of minerals. **(20)**

   (b) State 'Bowen's Reaction Principle' and explain with examples. **(15)**

2. (a) Explain the process of sedimentation. Briefly discuss the features of sedimentary rocks. **(15)**

   (b) What is metamorphism? Describe the types of metamorphism. **(10)**

   (c) Differentiate between 'Foliated' and 'Unfoliated' texture. **(10)**

3. (a) Discuss seismicity at convergent and divergent plate boundaries with sketches. **(15)**

   (b) Mention different types of erosion process and describe 'water erosion'. **(10)**

   (c) Write short notes on (i) marble and (ii) quartzite. **(10)**

4. (a) Briefly describe different types of fold with neat sketches. **(15)**

   (b) Differentiate between: (i) normal fault and thrust fault (ii) 'graben' and 'horst'. **(10)**

   (c) Why Bangladesh is susceptible to earthquake? What are the tectonic blocks of Bangladesh? **(10)**

SECTION – B

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

5. (a) Define geomorphology and briefly describe geomorphic cycle or cycle of erosion. **(7)**

   (b) Briefly describe different types of alluvial streams. **(15)**

   (c) What do you understand by helicoidal flow? Describe the theories of meandering. **(13)**

6. (a) Define glacial deposits and briefly describe different types of glacial deposits. **(7)**

   (b) Write short note on (i) eskers (ii) kames and kettleholes (iii) loess (iv) dunes. **(16)**

   (c) Draw a typical sandy beach profile showing all the components of a beach. **(6)**

   (d) Define (i) coast (ii) continental shelf (iii) inshore **(6)**

Contd P/2

WRE 203

7. (a) What do you understand by fluvial deposits? Briefly describe landforms and geologic features resulting from stream deposits. **(12)**

(b) A stream network is shown in the Fig. 1. Make stream ordering according to Horton's method and Strahler's method of stream order. Also calculate bifurcation ratio and length ratio. Given that the mean length of 1st, 2nd, 3rd and 4th order streams are 5 miles, 30 miles, 100 miles and 175 miles respectively. **(15)**

(c) What do you understand by drainage texture? Calculate stream frequency for the stream network shown in Fig. 1. Given that length of overland flow is 100 miles. **(8)**

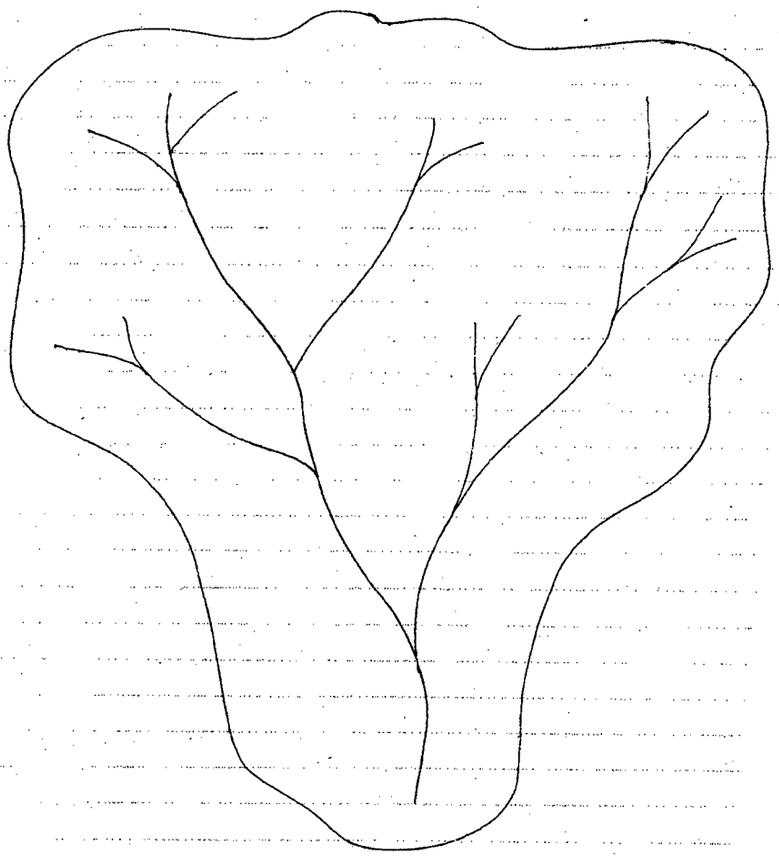


Figure – 1 for Q 7 (b) & 7 (c)

8. (a) Define alluvial fans and cones. Briefly describe different types of drainage patterns with neat sketches. **(15)**

(b) Write short note on (i) oxbow lakes (ii) neck cutoff (iii) wind erosion. **(9)**

(c) What do you understand by lacustrine deposits? Briefly describe various types of lacustrine deposits. **(11)**
