L-2/T-1/CE **Date : 03/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2017-2018

Sub : **CE 211** (Mechanics of Solids I)

Full Marks : 210 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**.

Assume reasonable value for any missing data.

1. Using differential equations of equilibrium, find the general expression for shear and bending moment for the beam shown in Fig. 1. From the derived expressions, draw shear force and bending moment diagrams. Locate the position of maximum moment and corresponding magnitude. **(26¼)**

2. (a) With a neat sketch, derive expressions for longitudinal and hoop (transverse) stress that would develop in the shell of a cylindrical pressure container of thickness 't'. It is subjected to an internal pressure intensity of p_o and has outside and inside diameter of D_o and D_i respectively. **(13)**

   (b) A cylindrical steel pressure vessel 400 mm in diameter (outside) with wall thickness of 20 mm is subjected to an internal pressure of 10.4 MPa. Calculate the longitudinal and transverse stress from basic equilibrium equation. What is the factor of safety if ultimate strength of steel is 470 MPa? **(13¼)**

3. Determine the location of shear centre for the beam cross section shown in Fig. 2. Flanges and web are of constant thickness (3 mm) all over. Also, compute the maximum shearing stress (i.e. at neutral axis level) if a vertical shear of 690 N is applied through the shear centre of the section. **(16+10¼)**

4. A wooden box beam made up from 50 mm thick boards, has the dimensions shown in Fig. 3. It the beam transmits a vertical shear of 5000 N, what should be the longitudinal spacing of the nails (i) for connecting board A with vertical boards C and D, and (ii) for connecting board B with boards C and D? Shear capacity of each nail is 310 N. First show that $I = 9.381 \times 10^8$ mm^4 for the section. **(26¼)**

5. Find the reactions for the frame loaded as shown in Fig. 4. Draw shear force, axial force and bending moment diagrams for the members AB, BC and CD of the frame. **(26¼)**

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CE 211

SECTION – B

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

6. (a) Derive the elastic torsion formula for computing shear stress in a solid circular shaft. State the assumptions for this derivation. **(10)**

   (b) The solid circular shaft as shown in Fig. 5 is acted upon by the torque indicated. What is the maximum stress in the shaft due to the applied torques and between what two pulleys it occurs? Also determine the relative twist between the end pulleys. Given: G = 80 GPa. **(16¼)**

7. (a) A thin-walled cross-section in the form of a simplified airfoil is shown in Fig. 6. Determine the torque it would carry at a maximum shear stress of 20 MPa. Neglect the effect of stress concentrations. **(10)**

   (b) A timber beam is to support the three concentrated loads shown in Fig. 7. Determine the minimum required depth d of the beam. Knowing that for the grade of timber used, σ_{all} = 1800 psi τ_{all} = 120 psi. **(16¼)**

8. A rod consisting of two cylindrical portion AB and BC (Fig. 8) is restrained at both ends. Portion AB is made of steel (E = 200 GPa; $\alpha = 11.6 \times 10^{-6}$/°C) and portion BC is made of Brass (E = 105 GPa; $\alpha = 20.9 \times 10^{-6}$/°C). Knowing that the rod is initially unstressed determine, **(26¼)**

   (a) the normal stress induced in AB and BC due to a temperature rise of 60°C and

   (b) the corresponding deflection at point B

9. (a) A 500 mm long and 20 mm dia rod is observed to increase in the length by 0.4 mm and decrease in diameter by 0.005 mm when subjected to an axial load of 50 kN. Determine the Poisson's ratio, modulus of elasticity and shear modulus. **(10)**

   (b) Determine the stresses in each wires supporting the rigid bar shown in Fig. 9 if F = 20 kN. **(16¼)**

10. The beam section shown in Fig. 10 is subjected to a positive bending moment of 30 kN-m. Determine, **(26¼)**

    (a) The neutral axis and moment of inertia of the section.

    (b) The stresses in extreme fibers.

    (c) The resultant compressive force above neutral axis.

    (d) The resultant tensile force below neutral axis.

    (e) The moment arm of the couple.

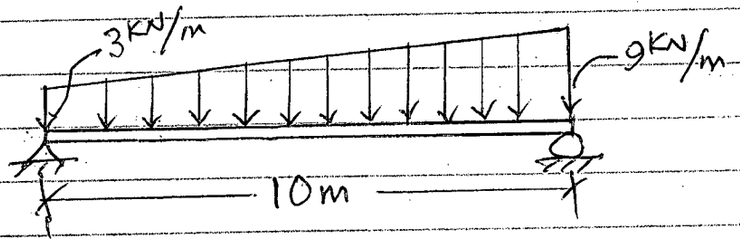

FIG. 1.

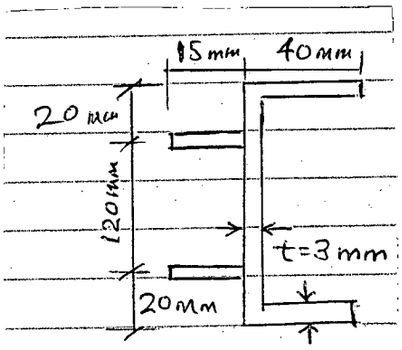

Fig. 2

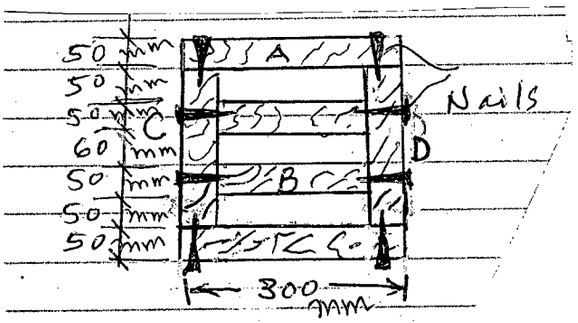

Fig. 3

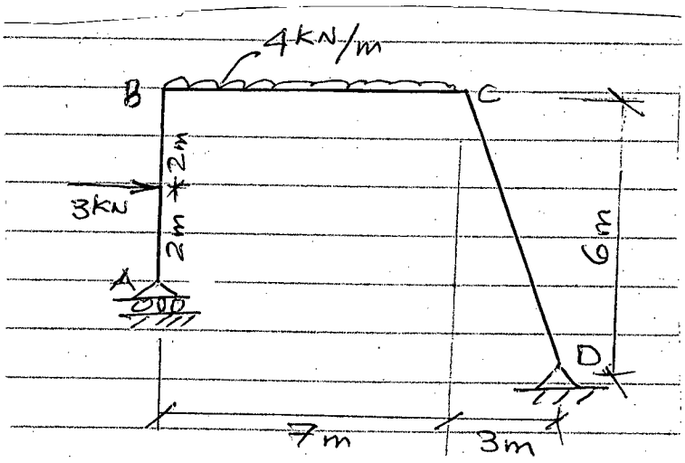

Fig. 4.

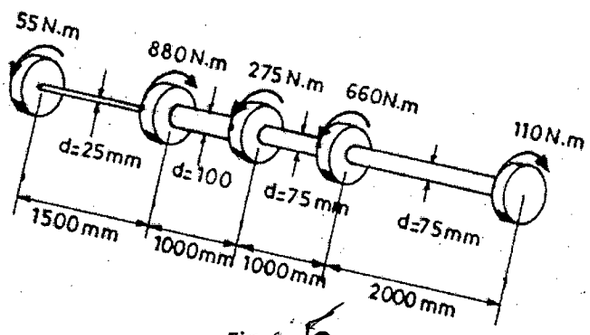

Fig. 5

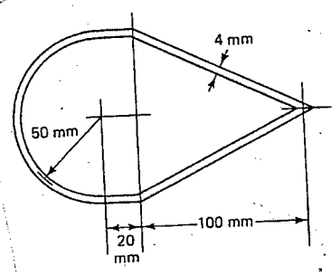

Fig. 6

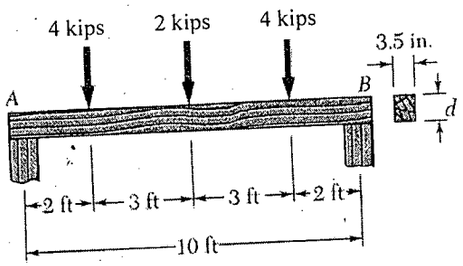

Fig. 7

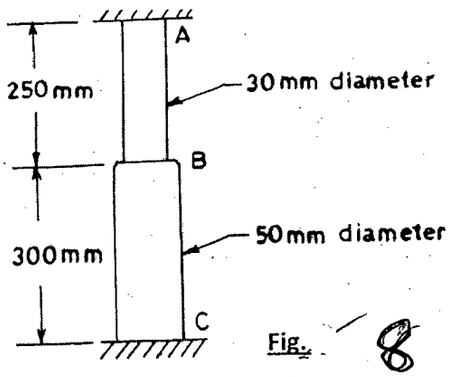

Fig. 8

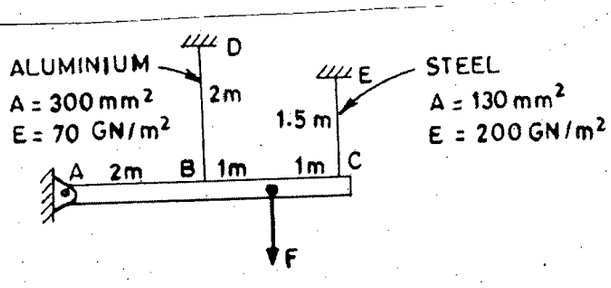

Fig. 9

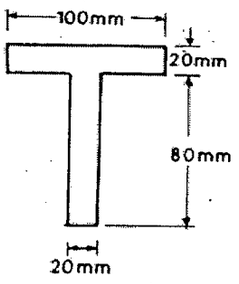

Fig. 10

L-2/T-1/CE **Date : 12/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2017-2018

Sub : **CE 201** (Engineering Materials)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

Symbols used have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) Briefly describe the acid test for stone. How does curing affect the strength of concrete? **(10)**

   (b) Compare between: (i) thermoplastic material and thermosetting material; (ii) natural rubber and synthetic rubber. **(10)**

   (c) Compare between cast iron and mild iron in terms of carbon content, structure, tensile and compressive strength. **(10)**

   (d) List five principal methods for manufacturing different grades of steel. **(5)**

2. (a) Draw a typical section of ferrocement and show its different components. Write down the required specifications of aggregate (sand) as per BNBC (1993) for using it in ferrocement. **(10)**

   (b) What is spalling of concrete? How does ferrocement reduces the chances of further spalling of concrete? **(10)**

   (c) Why does correction occur? How can you prevent corrosion of steel in RC element and steel? **(10)**

   (d) List the properties of plastic laminates. **(5)**

3. (a) Define: (i) Gauge length, (ii) plastic flow zone, (iii) modulus of toughness, (iv) modulus of resilience. Draw necessary diagram. **(10)**

   (b) For the following loading sequence (Fig. 1) draw the likely strain response with of: (i) a plastic material and (ii) an elastic-plastic material. Assume equal time interval i.e., **(10)**

   $\nabla t = t_1 - t_0 = t_2 - t_1 = t_3 - t_2 = t_4 - t_3$

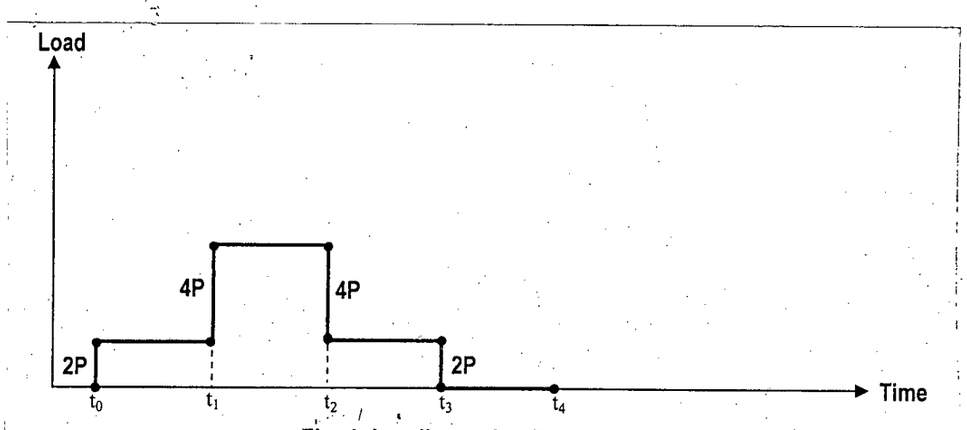

Fig. 1. Loading-unloading sequence

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CE 201

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(c) Write down the characteristics of plastic strain and viscous strain. Write down the functions of silica and lime in glass. **(10)**

(d) Write down five important requirements of a good sound insulating material. **(5)**

4. (a) Write down the probable causes and remedies of (i) segregation and (ii) bleeding of concrete. **(10)**

(b) Determine the preliminary mix proportion of the concrete mix for the casting of a floor slab on absolute volume basis. The target mean strength of the concrete is 28 MPa at 28 days and maximum allowable slump is 38 mm. Use ACI 211.1 Method with the following data to find the ingredient contents when the maximum aggregate size is 25 mm. Also find the moisture-adjusted ingredients for a trial batch of nine 100 mm cylinders. **(20)**

Cement:

Ordinary Portland Cement with specific gravity 3.15

Coarse Aggregate:

Maximum Size: 25 mm

Absorption Capacity: 1.5%

Moisture Content: 2%

Bulk Specific Gravity (OD): 2.62

Dry-rodded Unit Weight: 1600 kg/m^3

Fine Aggregate:

Fineness Modulus: 2.70

Absorption Capacity: 2.8%

Moisture Content: 3.5%

Bulk Specific Gravity (OD): 2.68

Dry-rodded Unit Weight: 1550 kg/m^3

Use provided Table 1-4. Also, assume reasonable values for any missing data.

(c) How does the grading of aggregate affect the strength and durability of concrete? **(5)**

SECTION – B

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

5. (a) Make comparison of different types of lime used in construction. **(9)**

(b) Differentiate hardwood and softwood. Draw a neat sketch of a tree trunk cross section and describe the function of different parts of the trunk section. **(4+10)**

(c) Write down some advantages of using concrete blocks instead of bricks. A brick sample of 1.254 kg oven dry weight is tested for determination of unit weight of brick. If the amount of water displaced by wax coated brick is 1.115 kg, calculate the unit weight

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CE 201

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of the brick. Note that about 265 gm is used to make wax coating around the brick sample. Assume specific gravity of wax is 0.865 and density of water = 1 gm/cc. **(4+8)**

6. (a) Draw the plan of a typical circular Hoffman Kiln showing the chambers used for different functions. Also write which does should remain closed and which are remain open during operation. **(7)**

(b) What is mortar? List the characteristics of a good mortar? **(5)**

(c) What is hydration of cement? How does the hydration impact the cement properties? How can you reduce the heat of hydration? **(2+4+2)**

(d) Writ down the suitability of the different bases used in oil painting. Write down the classification of varnish based on the solvent used and also define applicability of each type. **(15)**

7. (a) What is aggregate blending? Why is it necessary? **(5)**

(b) Differentiate between – (i) dry rot and wet rot.

A maple wood sample having a wood cell wall specific gravity of 1.54 is seasoned by air seasoning. After several month of seasoning the moisture content is found to be 18.5%. From previous test it is found that the wood just sinks at 72% moisture content. Calculate – (i) maximum possible moisture content and (ii) density of wood after air seasoning. **(5+8)**

(c) Describe briefly quick lime manufacturing process in – (i) shaft kiln and (ii) rotary kiln. **(8)**

(d) What are benefits of using manufactured sand over natural sand? Briefly discuss bulking of sand. **(4+5)**

8. (a) What are the functions of the following ingredients in cement? (i) Lime; (ii) Silica; (iii) Iron Oxide (iv) Magnesia. **(12)**

(b) Determine the FM of the sand from the following sieve analysis data. Also draw the gradation curve and comment on the gradation type of the given sand sample. **(13)**

Sieve Opening (mm)	4.75	2.36	1.18	0.6	0.42	0.3	0.15	0.075	PAN
Amount Retained (gm)	9	20	106	14	153	134	50	12	2

(c) Name and discuss various types of special mortar used in construction. **(7)**

(d) Name some field tests of cement. **(3)**

Table 1: Relationship between water to cement ration and compressive strength of concrete

Compressive strength at 28 days, MPa	Water-cementitious materials ratio by mass	
	Non-air-entrained concrete	Air-entrained concrete
45	0.38	0.30
40	0.42	0.34
35	0.47	0.39
30	0.54	0.45
25	0.61	0.52
20	0.69	0.60
15	0.79	0.70

Strength is based on cylinders moist-cured 28 days in accordance with ASTM C 31 (AASHTO T 23). Relationship assumes nominal maximum size aggregate of about 19 to 25 mm.
Adapted from ACI 211.1 and ACI 211.3.

Table 2: Recommended slumps for various types of construction

Concrete construction	Slump, mm (in.)	
	Maximum*	Minimum
Reinforced foundation walls and footings	75 (3)	25 (1)
Plain footings, caissons, and substructure walls	75 (3)	25 (1)
Beams and reinforced walls	100 (4)	25 (1)
Building columns	100 (4)	25 (1)
Pavements and slabs	75 (3)	25 (1)
Mass concrete	75 (3)	25 (1)

*May be increased 25 mm (1 in.) for consolidation by hand methods, such as rodding and spading.
Plasticizers can safely provide higher slumps.
Adapted from ACI 211.1.

Table 3: Approximate mixing water and target air content requirements for different slumps and nominal maximum sizes of aggregates

Slump, mm	Water, kilograms per cubic meter of concrete, for indicated sizes of aggregate*							
	9.5 mm	12.5 mm	19 mm	25 mm	37.5 mm	50 mm**	75 mm**	150 mm**
	Non-air-entrained concrete							
25 to 50	207	199	190	179	166	154	130	113
75 to 100	228	216	205	193	181	169	145	124
150 to 175	243	228	216	202	190	178	160	—
Approximate amount of entrapped air in non-air-entrained concrete, percent	3	2.5	2	1.5	1	0.5	0.3	0.2
	Air-entrained concrete							
25 to 50	181	175	168	160	150	142	122	107
75 to 100	202	193	184	175	165	157	133	119
150 to 175	216	205	197	184	174	166	154	—
Recommended average total air content, percent, for level of exposure:†								
Mild exposure	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
Moderate exposure	6.0	5.5	5.0	4.5	4.5	4.0	3.5	3.0
Severe exposure	7.5	7.0	6.0	6.0	5.5	5.0	4.5	4.0

* These quantities of mixing water are for use in computing cementitious material contents for trial batches. They are maximums for reasonably well-shaped angular coarse aggregates graded within limits of accepted specifications.
** The slump values for concrete containing aggregates larger than 37.5 mm are based on slump tests made after removal of particles larger than 37.5 mm by wet screening.
† The air content in job specifications should be specified to be delivered within −1 to +2 percentage points of the table target value for moderate and severe exposures.
Adapted from ACI 211.1 and ACI 318. Hover (1995) presents this information in graphical form.

Table 4: Bulk volume of coarse aggregate per unit volume of concrete

Nominal maximum size of aggregate, mm (in.)	Bulk volume of dry-rodded coarse aggregate per unit volume of concrete for different fineness moduli of fine aggregate*			
	2.40	2.60	2.80	3.00
9.5 (⅜)	0.50	0.48	0.46	0.44
12.5 (½)	0.59	0.57	0.55	0.53
19 (¾)	0.66	0.64	0.62	0.60
25 (1)	0.71	0.69	0.67	0.65
37.5 (1½)	0.75	0.73	0.71	0.69
50 (2)	0.78	0.76	0.74	0.72
75 (3)	0.82	0.80	0.78	0.76
150 (6)	0.87	0.85	0.83	0.81

*Bulk volumes are based on aggregates in a dry-rodded condition as described in ASTM C 29 (AASHTO T 19). Adapted from ACI 211.1.

L-2/T-1/CE **Date : 18/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2017-2018

Sub : **MATH 237** (Laplace Transform and Vector Analysis)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

Symbols used have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) For which value of a the vectors (1,1,2), (2,3,a) and (4,5,5) are linearly dependent. Also find a linear combination among them. **(15)**

   (b) Prove that $\mathbf{[a\times p, b\times q, c\times r] + [a\times q, b\times r, c\times p] + [a\times r, b\times p, c\times q] = 0}$ **(8)**

   (c) A boatman wants to cross a canal that is 3 km wide and wants to land at a point 2 km upstream from his starting point. The current in the canal flows at 3.5 km/h and the speed of his boat is 13.5 km/h. Using velocity components find **(12)**

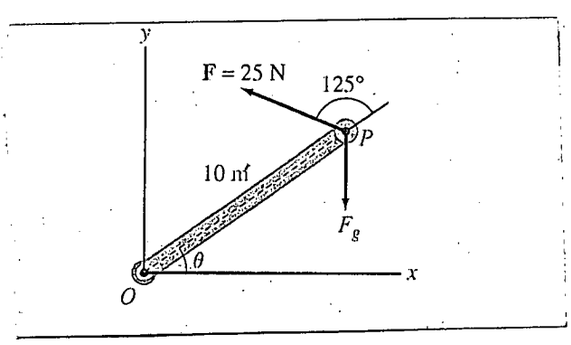
   (i) in what direction should he steer?

   (ii) How long will the trip take?

2. (a) Sketch the space curve x = 3cost, y = 3sint and z = 4t, find the unit Tangent **T**, the principal normal **N**, the binormal **B**. **(12)**

   (b) Solve for **x** and **y** from the simultaneous vector equations $\mathbf{x + c \times y = a}$, $\mathbf{y + c \times x = b}$ with $\mathbf{a, b, c \neq 0}$. **(12)**

   (c) Calculate the net torque about *O* at *P*, assuming that a 30-kg mass is attached at *P* on the mechanical arm in following figure. The force Fg due to gravity on a mass w has magnitude 9.8 wm/s^2 in the downward direction. **(11)**



3. (a) The Bernoulli spiral (see following figure) with space curve $\mathbf{r}(t) = (e^t \cos 4t, e^t \sin 4t)$ has the property that the angle ψ between the position vector and the tangent vector is constant. Find the angle ψ in degrees. **(15)**

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MATH 237/CE

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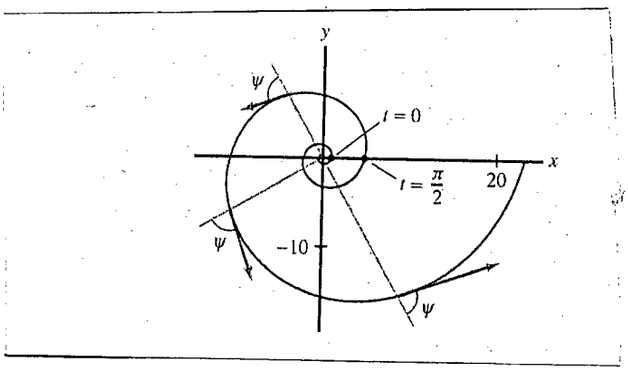


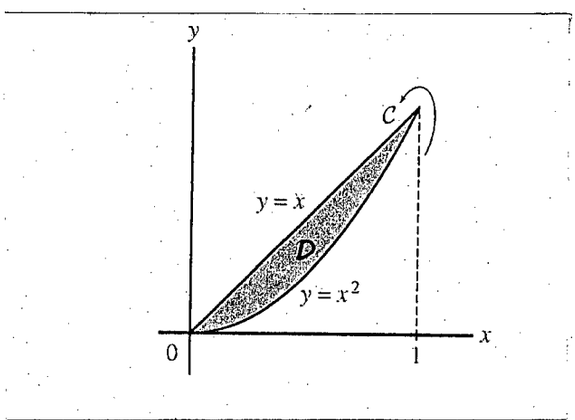
(b) Find the values of the constants a,b,c so that the directional derivative of $\varphi = axy^2 + byz + cz^2x^3$ at (1,2,-1) has a maximum of magnitude 64 in a direction parallel to the z axis. **(10)**

(c) Show that the vector field $\mathbf{v} = \dfrac{-x\mathbf{i} - y\mathbf{j}}{\sqrt{x^2 + y^2}}$ is a sink field. **(10)**

4. (a) Prove that $\mathbf{F} = (y^2\cos x + z^3)\mathbf{i} + (2y\sin x - 4)\mathbf{j} + (3xz^2 + 2)\mathbf{k}$ is a conservative force field, then find the scalar potential for **F**. **(10)**

(b) A bullet is fired from the ground at an angle of 60° above the horizontal. What initial speed v_0 must the bullet have in order to hit a point 150 m high on a tower located 250 m away (ignoring air resistance)? **(12)**

(c) Find total work done for $\mathbf{F} = (x + y)\mathbf{i} + (x^2 - y)\mathbf{j}$ which moves a particle along the path *C*. **(13)**



SECTION – B

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

5. (a) Use Green's theorem to find the area of the integral $\oint_C \left[(3x^2 - 8y^2)dx + (4y - 6xy)dy\right]$, where *C* is the region bounded by the curves $y^2 = x$ and $x^2 = y$. **(10)**

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MATH 237/CE

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(b) State the divergence theorem and verify this theorem for $\overline{F} = 4xzi - y^2 j + yzk$ taken over the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0 and z = 1. **(25)**

6. (a) If $L\{F(t)\} = f(s)$, then show that $\left\{\frac{F(t)}{t}\right\} = \int_s^\infty f(u)\,du$ and hence find $L\left\{\frac{\cos ax - \cos bx}{t}\right\}$ **(14)**

(b) Find $L\{erf(\sqrt{t})\}$ and use Laplace transform to find $\int_0^\infty e^{-t}\, t\, erf(\sqrt{t})\,dt$ **(14)**

(c) Show that $L\left\{\int_0^t \frac{1-e^{-u}}{u}\,du\right\} = \frac{1}{s} In\left(\frac{s+1}{s}\right)$. **(7)**

7. (a) Evaluate $L^{-1}\left\{\left(\frac{\sqrt{s}-1}{s}\right)^2\right\}$. **(8)**

(b) Evaluate $L^{-1}\left\{\frac{3s+1}{(s-1)(s^2+1)}\right\}$ by using Heaviside's expansion formula. **(12)**

(c) Use convolution theorem, to find $L^{-1}\left\{\frac{8}{(s^2+1)^3}\right\}$. **(15)**

8. Solve the following differential equations by Laplace transform:

(a) Y''(t) +Y' (t) - 2Y (t) = sint, Y(0) = Y'(0) = 0 **(15)**

(b) Y''(t) - tY'(t) + Y(t) = 0, given that Y(0) = 1, Y'(0) = 2 **(20)**

L-2/T-1/CE **Date : 24/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2017-2018

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

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

Symbols have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) Define Geology. Name the different branches of Geology. **(8)**

   (b) Give a list of the different applications of Geology. **(8)**

   (c) Briefly describe any three eras of geological time. **(11)**

   (d) What do you mean by rock-cycle? Present a flow chart of the rock-cycle. **(8)**

2. (a) With neat sketches, describe the different type of fault systems. Briefly describe the physiographical and lithological evidences that may be used for the identification of faults. **(17)**

   (b) Distinguish between the following **(6×3=18)**

   (i) Plucking and Abrasion methods of glacier erosion.

   (ii) Seamounts and Mid-oceanic Ridges

   (iii) Earthquake Magnitude and Intensity

3. (a) What do you mean by PANGAEA and continental drift? Briefly describe the different evidences supporting this hypothesis. **(12)**

   (b) Write short notes on **(4×4=16)**

   (i) Intrusive igneous rock

   (ii) Principle of uniformity

   (iii) Shale

   (iv) Continental Glacier/Ice Sheet

   (c) Briefly discuss the factors and causes related to the origin of volcanoes. **(7)**

4. (a) Briefly describe the formation of the following with neat sketches **(4×3=12)**

   (i) Angular unconformity (ii) Residual soil (iii) Columnar joints

   (b) What do you mean by texture of rock? Briefly describe the different textures found in metamorphic rock. **(10)**

   (c) What is the importance of sedimentary structures? Briefly describe any three sedimentary structures with neat sketches. **(8)**

   (d) Present a neat diagram showing the locations of magma eruption. **(5)**

Contd P/2

CE 203

SECTION – B

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

5. (a) Explain the following terms with respect to an alluvial land formation: (i) meandering River, (ii) Oxbow lake, (iii) cutoff, (v) natural levee. **(12)**

   (b) Explain with diagram the variation of the various morphological parameters of a river basin as it flows in the downstream direction. Explain these variations in the context of Bangladesh. **(23)**

6. (a) With all necessary diagrams, explain the channel cross sectional changes during one flood season. Explain the movement of light and heavy particles during the season. Explain these changes with the variation of the river discharge as well. **(23)**

   (b) Write short notes on (i) Rectangular, (ii) Trellis, (iii) Radial types of drainage patterns with diagrams. **(12)**

7. What is river transportation? What are the factors affecting the transportation power of a river? How the knowledge of river transportation can help in determining: (i) suitable size and (ii) adequate volume of blocks in flood protection embankment design? **(35)**

8. (a) What is longitudinal bed profile of a stream? What information does it give? Show schematically the differences between a theoretical profile and an actual one for a natural river. Derive the general equation of longitudinal bed profile of a stream and mention how to derive specific equations for different channels. **(25)**

   (b) Explain the following terms: (i) Drainage Density and (ii) Stream Frequency. In Bangladesh context, explain (with diagram) how these parameters can vary among the different regions. **(10)**

L-2/T-1/CE **Date : 30/09/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2017-2018

Sub : **HUM 353** (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) What is meant by contribution margin and contribution margin ratio? **$(3\frac{1}{3})$**

(b) Volver Company manufactures 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: **(20)**

Sales (20,000 Units @ Tk. 60)	Tk. 12,00,000
Less: Variable cost	9,00,000
Contribution margin	3,00,000
Less: Fixed cost	2,40,000
Net income	60,000

Requirements :

(i) Compute the company's CM ratio;

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

(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 Tk. and in percentage form.

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

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

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

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

(b) Chuck wagon grills manufacturing company makes barbecue grill that it sells for Tk. 210. Data for Last year's operations follow: **(20)**

Contd P/2

HUM 353

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

Unit produced	20,000
Units sold	19,000
Variable Cost per unit:	
Direct materials	Tk. 50
Direct labor	80
Variable manufacturing overhead	20
Variable selling and administrative overhead	10
Fixed costs:	
Fixed manufacturing overhead	Tk. 700,000
Fixed selling and administrative overhead	285,000

Requirements:

(i) Compute unit product cost under both absorption costing and variable costing methods.

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

3. (a) What are the purposes of cost allocation? $(3\frac{1}{3})$

(b) The relevant data for allocating Service departments costs over production departments are given below: **(20)**

		Production Departments			Service Departments	
		A	B	C	D	E
Cost before allocation (Tk.)		7550	7200	9650	4625	1575
Service rendered by (in %)	D	20%	30%	40%	-	10%
	E	40%	30%	30%	10%	-

Requirements

Your are required to prepare a schedule for allocating the service departments cost over the production departments under each of the following methods:

(i) Direct method

(ii) Reciprocal Service Method.

4. (a) Define the terms "manufacturing cost" and " Non-manufacturing cost" with examples. $(3\frac{1}{3})$

Contd P/3

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Contd ... Q. No. 4

(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. **(10)**

Requirements:

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

(ii) Express the variable cost and fixed cost in the cost formula.

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

(c) The following costs and inventory data are taken from the accounting records of Mason Company for the year ended on December 31st 2015. **(10)**

Direct Labour cost	Tk. 70,000
Purchase of raw materials	118,500
Indirect Labour	30,000
Maintenance, factory	6,000
Advertising expenses	90,000
Insurance, factory	800
Sales commission	35,000
Supervisor's Salary	12,000
Rent, factory	30,000
Power and electricity	2,500
Fuel for factory equipment	700
Administrative manager's salary	55,000

Inventories:	Jan 01, 2009	Dec 31, 2009
Raw materials	Tk. 7000	Tk. 15,000
Work in process	10,000	5000
Finished goods	20,000	35,000

Requirements

(i) Prepare a cost of goods sold statement

(ii) If sales for the year 2009 is Tk. 500,000, prepare an income statement.

Contd P/4

HUM 353

SECTION – B

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

5. (a) What is meant by transaction? Discuss the classification of transaction into different categories. **($8\frac{1}{3}$)**

(b) On October 1, Mr. Nehan started his own consulting firm, Nehan's Consulting. The following transactions occurred during the month: **(15)**

(i) Invested cash Tk. 800,000 in the business.

(ii) Purchased equipment for Tk. 300,000 cash.

(iii) Paid Tk. 20,000 cash for October office rent.

(iv) Incurred Tk. 10,000 of advertising costs in the Daily Rising Sun, on account.

(v) Paid Tk. 5,000 cash for office supplies.

(vi) Performed services worth Tk. 200,000; Tk. 50,000 cash is received from customers, and the balance of Tk. 150,000 is billed to customers on account.

(vii) Withdrew Tk. 15,000 cash for personal use.

(viii) Paid the Daily Rising Sun Tk. 8,000 of the amount due in transaction (iv).

(ix) Paid employees' salaries Tk. 30,000.

(x) Borrowed Tk. 100,000 from the bank on a note payable.

Required:

Prepare a tabular analysis of the above transactions.

6. (a) "If a trial balance balances, it guarantees that there are no errors in the recording process." Do you agree? Why or why not? Justify. **($5\frac{1}{3}$)**

(b) On 1 April 2018, Sara's Consulting had the following balances in its ledger accounts: **(18)**

Cash	Tk. 100,000	Capital	Tk. 150,000
Accounts receivable	70,000	Service revenue	320,000
Supplies	13,000	Rent expense	12,000
Equipment	300,000	Salaries expense	20,000
Accounts payable	50,000	Utilities expense	5,000

During April 2018, the following transactions occurred:

April 3 Paid Tk. 15,000 cash for April office rent.

April 10 Incurred Tk. 10,000 of advertising costs in the Daily Star, on account.

April 16 Performed services worth Tk. 100,000; Tk.30,000 cash is received from customers, and the balance of Tk. 70,000 is billed to customers on account.

April 22 Withdrew Tk. 5,000 cash for personal use.

April 28 Paid employees' salaries Tk. 25,000.

Required:

i. Journalize the above transactions

ii. Post to the ledger accounts.

iii. Prepare a trial balance as on 30 April.

Contd P/5

HUM 353

7. (a) What is meant by adjusting the accounts? Describe various types of adjusting entries with an example of each. $(6\frac{1}{3})$

(b) The Barilgaon Rentals opened for business on January 1, 2017. Its trial balance before adjustment on December 31 is as follows: **(17)**

Barilgaon Rentals
Trial Balance
As on December 31, 2017

Sl. No.	Account Title	Debit (Tk.)	Credit (Tk.)
1.	Cash	20,000	
2.	Accounts Receivable	50,000	
3.	Supplies	10,000	
4.	Prepaid Insurance	30,000	
5.	Land	500,000	
6.	Buildings	400,000	
7.	Equipment	600,000	
8.	Accounts Payable		80,000
9.	Unearned Rent Revenue		120,000
10.	Mortgage Payable		300,000
11.	Owner's Capital		800,000
12.	Owner's Drawings	20,000	
13.	Rent Revenue		400,000
14.	Advertising Expense	20,000	
15.	Salaries & Wages Expense	40,000	
16.	Utilities Expense	10,000	
	Total	**1,700,000**	**1,700,000**

Other data:

(i) Prepaid insurance is a one-year policy starting June 1, 2017.

(ii) A count of supplies shows that Tk. 7,000 of supplies has been used during the year.

(iii) Annual depreciation is Tk. 20,000 on the buildings and Tk. 30,000 on the equipment.

(iv) The mortgage interest rate is 12%. (The mortgage was taken out on July 1.)

(v) Two-thirds of the unearned rent revenue has been earned.

(vi) Salaries of Tk. 20,000 are accrued and unpaid at December 31.

Required:

i. Prepare the adjusting entries that are necessary.

ii. Prepare an adjusted trial balance as on 31 December 2017.

8. (a) What is a financial statement? Discuss in brief the components of a complete set of financial statements. $(7\frac{1}{3})$

Contd P/6

HUM 353

Contd ... Q. No. 8

(b) The Taranagar Enterprise opened for business few years ago. Its trial balance on June 30, 2018 is as follows: **(16)**

Taranagar Enterprise
Trial Balance
As on June 30, 2018

Sl. No.	Account Title	Debit (Tk.)	Credit (Tk.)
1.	Cash	150,000	
2.	Accounts Receivable	100,000	
3.	Inventory (01.07.2018)	80,000	
4.	Supplies	30,000	
5.	Prepaid Insurance	45,000	
6.	Land	500,000	
7.	Buildings	800,000	
8.	Accumulated Depreciation - Buildings		440,000
9.	Equipment	600,000	
10.	Accumulated Depreciation - Equipment		330,000
11.	Accounts Payable		70,000
12.	Notes Payable		80,000
13.	Bank Loan (long-term)		300,000
14.	Owner's Capital		800,000
15.	Owner's Drawings	50,000	
16.	Sales Revenue		950,000
17.	Insurance Income		30,000
18.	Sales Returns	30,000	
19.	Purchase	500,000	
20.	Advertising Expense	30,000	
21.	Salaries & Wages Expense	80,000	
22.	Utilities Expense	5,000	
	Total	**3000,000**	**3000,000**

Other information:

(i) Ending inventory was valued Tk. 60,000.

(ii) Prepaid insurance of Tk. 10,000 has been expired during the year.

(iii) Supplies of Tk. 20,000 were used during the year.

(iv) Depreciation of buildings and equipment is Tk. 40,000 and Tk. 30,000, respectively.

(v) Salaries of Tk. 20,000 were still unpaid.

Required:

i. Prepare a multiple-step income statement for the year ended 30 June 2018

ii. Prepare a classified balance sheet as at 30 June 2018.