BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-2/T-1   B. Sc. Engineering Examinations 2015-2016
Sub : **MATH 237** (Laplace Transform and Vector Analysis)
Full Marks: 210   Time : 3 Hours
USE SEPARATE SCRIPTS FOR EACH SECTION
The figures in the margin indicate full marks.
Symbols used have their usual meaning.

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

1. (a) If the edges *OA*, *OB* and *OC* of a tetrahedron are **a**, **b** and **c** respectively and *G* be the centroid of the triangle *ABC*, find $\overrightarrow{BC} + \overrightarrow{CA} - \overrightarrow{AB}$ and $\overrightarrow{GA}$ in terms of **a**, **b** and **c**. **(12)**

   (b) If **a**, **b** and **c** are non-coplanar vectors, prove that the following four points are coplanar: **(11)**
   $$4\mathbf{a} + 5\mathbf{b} + \mathbf{c}, \ -\mathbf{b} - \mathbf{c}, \ 3\mathbf{a} + 9\mathbf{b} + 4\mathbf{c}, \ -4\mathbf{a} + 4\mathbf{b} + 4\mathbf{c}$$

   (c) A line makes angle a, b, c, d with the diagonal of a cube. Prove that
   $$\cos^2 a + \cos^2 b + \cos^2 c + \cos^2 d = \frac{4}{3}.$$ **(12)**

2. (a) Find (i) the curvature κ, (ii) the principal normal **N**, (iii) the binormal **B** and (iv) the torsion τ for the space curve $x = t - \dfrac{t^3}{3}$, $y = t^2$, $z = t + \dfrac{t^3}{3}$. **(20)**

   (b) Find $\nabla \cdot \left\{ \dfrac{f(r)\mathbf{r}}{r} \right\}$, where $\mathbf{r}$ is the position vector. **(15)**

3. (a) With the help of the equations $\nabla \cdot \mathbf{D} = \rho$, $\nabla \cdot \mathbf{H} = 0$, $\nabla \times \mathbf{H} = \dfrac{1}{c}\left(\dfrac{\partial \mathbf{D}}{\partial t} + \rho \mathbf{V} \right)$ and
   $\nabla \times \mathbf{D} = -\dfrac{1}{c}\dfrac{\partial \mathbf{H}}{\partial t}$ prove that $\nabla^2 \mathbf{D} - \dfrac{1}{c^2}\dfrac{\partial^2 \mathbf{D}}{\partial t^2} = \nabla \rho + \dfrac{1}{c^2}\dfrac{\partial(\rho \mathbf{V})}{\partial t}$ and $\nabla^2 \mathbf{H} - \dfrac{1}{c^2}\dfrac{\partial^2 \mathbf{H}}{\partial t^2} = -\dfrac{1}{c}\nabla \times (\rho \mathbf{V})$.
   Where *c* is a constant and *t* is the time. **(12)**

   (b) Find the values of the constants a, b and c so that the directional derivative of $\varphi = axy^2 + byz + cz^2 x^3$ at (1,2,-1) has a maximum magnitude 64 in the direction parallel to *z* axis. **(11)**

   (c) Evaluate $\displaystyle\int_c \mathbf{F} \cdot d\mathbf{r}$ where $\mathbf{F} = (y\mathbf{i} - x\mathbf{j})/(x^2 + y^2)$ and *c* is the circular path $x^2 + y^2 = 1$ described in counter clockwise sense. **(12)**

4. (a) Show that $\mathbf{F} = (\sin y + z)\mathbf{i} + (x \cos y - z)\mathbf{j} + (x - y)\mathbf{k}$ is irrotational. Is *F* conservative? If so, find a function *G* such that $\mathbf{F} = \nabla G$. **(17)**

   (b) If $\mathbf{F} = y\mathbf{i} + (x - 2xz)\mathbf{j} - xy\mathbf{k}$ evaluate $\displaystyle\iint_s (\nabla \times \mathbf{F}) \cdot \mathbf{n} \, ds$ where *s* is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ above the *xy* plane. **(18)**

MATH 237 (CE)

SECTION – B

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

5. (a) State Stoke's theorem and verify this theorem for $\overline{F} = (2x-y)i - yz^2 j - y^2 zk$, where S is the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ and C is its boundary. **(18)**

    (b) Evaluate $\iint_S (\nabla \times \overline{F}) \bullet \overline{n} \, dS$ by using Gauss divergence theorem, where **(17)**

    $\vec{F} = (x-z)\hat{i} + (x^3 + yz)\hat{j} - 3xy^2 k$ and S is the surface of the cone $z = 2 - \sqrt{x^2 + y^2}$ above the xy-plane.

6. (a) Find $L\left\{erf\left(\sqrt{t}\right)\right\}$ **(8)**

    (b) Find $L\left\{t \sin^3 t \cos t\right\}$ and hence evaluate $\int_0^\infty e^t t \sin^3 t \cos t \, dt$ **(9)**

    (c) If $L\{F(t)\} = f(s)$, then show that $L\left\{\dfrac{F(t)}{t}\right\} = \int_S^\infty f(u)du$ and hence evaluate

    $\int_0^\infty \dfrac{\sin^2 t}{t^2} dt.$ **(18)**

7. Evaluate the following:

    (a) $L^{-1}\left\{\dfrac{S}{(S+1)^{5/2}}\right\}$ **(8)**

    (b) $L^{-1}\left\{\dfrac{3s+1}{(s-1)(s^2+1)}\right\}$ by using Heaviside's expansion formula **(15)**

    (c) $L^{-1}\left\{\dfrac{s^2}{(s^2+9)^2}\right\}$ by using convolution theorem. **(12)**

8. (a) Solve $Y''(t) + atY'(t) - 2aY(t) = 1$, given that $Y(0) = Y'(0) = 0$, $a > 0$ by using Laplace transform. **(18)**

    (b) Use finite Laplace transforms to solve the following boundary value problem **(17)**

$$\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2}, \quad 0 < x < 1, \ t > 0$$

given that $U(0,t) = U(1,t) = 0$, $U(x,0) = 3\sin 2\pi x$.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1   B. Sc. Engineering Examinations 2015-2016

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

Full Marks: 210   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Assume reasonable value for any missing data. Figures and Tables are attached.

SECTION – A

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

1. Draw axial force, shear force and bending moment diagrams for the beam of Fig. 1.   **(26⅓)**

2. A beam supports UDL of w/metre as shown in Fig. 2. Determine the maximum value of 'w' that will not exceed a shearing stress of 1.25 MPa in beam section. Draw shear stress distribution across the depth of the beam section showing their values at levels 0 mm, 25 mm, 75 mm and 150 mm (N.A.) for the maximum shear force that it carries.   **(26⅓)**

3. A 5 metre span simple beam carries 12 kN Point Load at midspan. The beam is made of 50 mm by 150 mm size wooden planks screwed together, as shown in Fig. 3. Find the maximum shearing stress in the section and the pitch of the screws if each screw can resist 945 N.   **(26⅓)**

4. (a) A cylindrical pressure container is made of steel plate having a thickness of 22 mm. The inside diameter of the container is 1000 mm. Determine the maximum internal pressure that can be applied if the longitudinal stress is limited to 80 MPa and the hoop stress is not to exceed 150 MPa.   **(13)**

    (b) Show that the maximum shearing stress in a beam having thin walled tubular section is twice the average shear stress.   **(13⅓)**

5. Find the reactions of the frame shown in Fig. 4. Determine the internal forces at section 1-1, 2-2 and 3-3 where these are the mid-points of members BC, CD and CE respectively.   **(26⅓)**

    Draw axial force, shear force and bending moment diagrams for the horizontal member ABCD only.

SECTION – B

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

6. (a) A 500 mm long, 16 mm diameter rod is observed to increase in length by 300 μm (300 micrometer) and to decrease in the diameter by 2.4 μm when subjected to an axial load of 25 kN. Determine the modulus of elasticity, Poisson's ratio and shear modulus. **(10)**

   (b) A structural steel plate with E = 210 GPa and v = 0.3 has the dimension as shown in Fig. 5, before loading. The plate is then subjected to a state of plane stress xy plane with $\sigma_x = 150$ MPa. For what value of stress σ_y will the dimension Y of the plate remain unchanged? What are the final dimensions of the plate in other two directions? **(16¼)**

7. (a) Derive the elastic torsion formula for solid circular shafts. State the limitations of this formula. **(10)**

   (b) The composite shaft shown in Fig. 6 consists of a 5 mm thick brass jacket (G_b = 39 GPa) bonded to a 40 mm diameter steel core (G_{st} = 77 GPa). The shaft is subjected to a 600 N-m torque, determine the maximum shearing stresses in the brass jacket and in steel core. Also, determine the angle of twist of B relative to A. **(16¼)**

8. (a) What is the required diameter of pin B for the bell crank mechanism shown in Fig. 7, if an applied force of 100 kN at A is resisted by a force P at C. The allowable shear stress is 120 MPa. **(10)**

   (b) Three identical equally spaced steel wires attached to a rigid bar, support a man M developing a downward force of 5 kN, as shown in Fig. 8. Initially, the force is equally distributed among the three wires. The stresses in the wires are well within the linearly elastic range of material behaviour. Determine the forces in the wires caused by the temperature drop of 50°C in the right wire. Properties of the wires: **(16¼)**

A = 10 mm²,	L = 2000 mm
E = 200 GPa,	α = 12.5 × 10⁻⁶/°C

9. A shaft having the cross-section shown in Fig. 9 is subjected to a torque T = 150 N-m.
   (a) Estimate the percentage of torque carried by each of the two cross-sectional components and calculate the maximum shear stresses in each part. Neglect stress concentrations. **(14)**

   (b) Find the angle of twist per unit length caused by the applied torque. **(10)**
       Given: G = 25 × 10³ GPa.
       Table of coefficients for rectangular bars are attached in Table A.

10. A channel shaped member, as shown in Fig. 10, acts as a horizontal beam in a machine. When vertical forces are applied to this member the distance AB increases by 0.0010 in. and the distance CD decreases by 0.0090 in. Determine the normal stresses in the extreme fibers? Also, find the magnitude and sense of the applied moment. The material behaves as linearly elastic and E = 15 × 10⁶ psi. **(26¼)**

Fig. 1

Fig. 2

SEC. A-A

Fig. 3

50×150 planks

screw
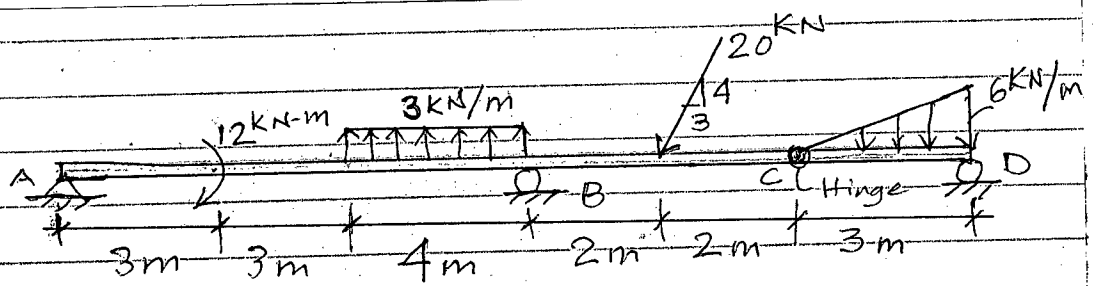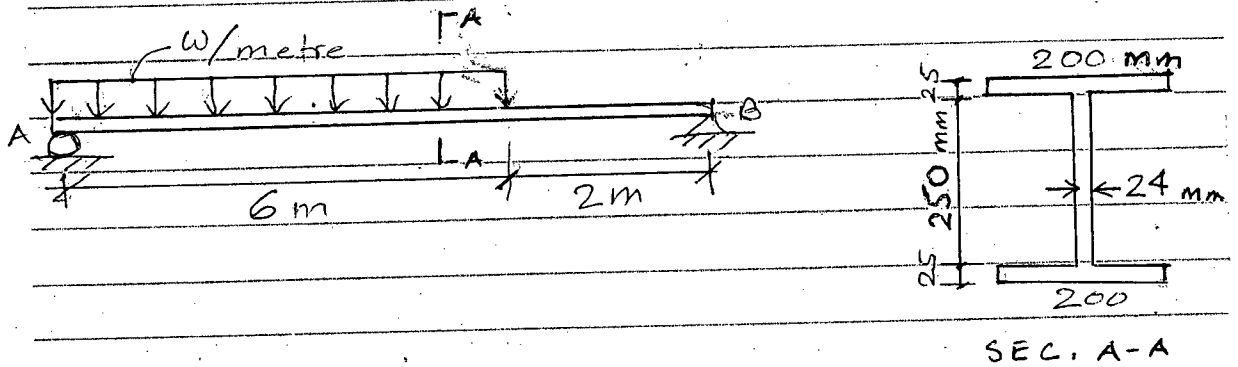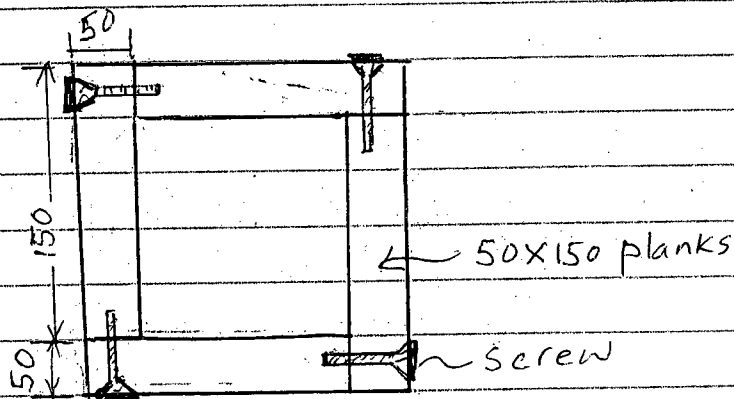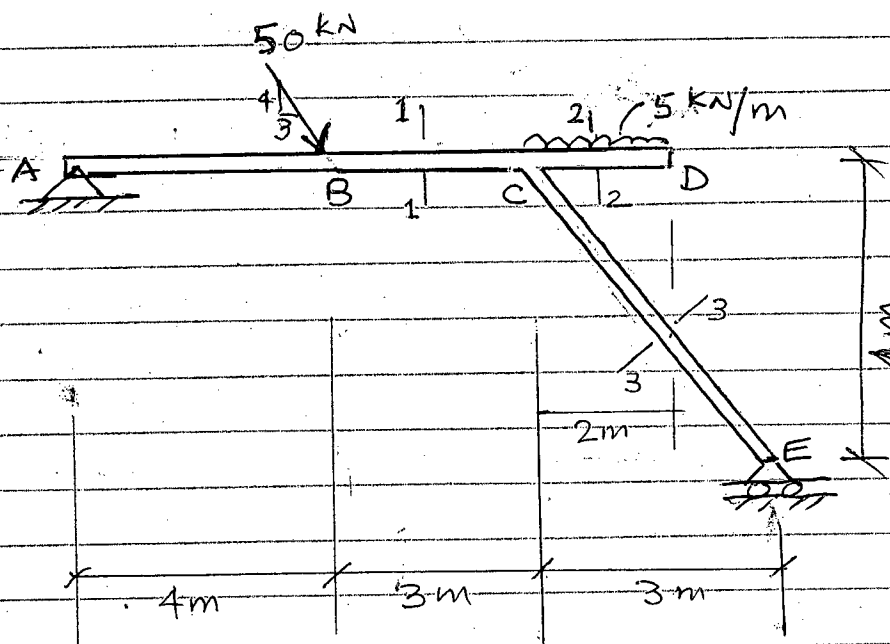
Fig. 4
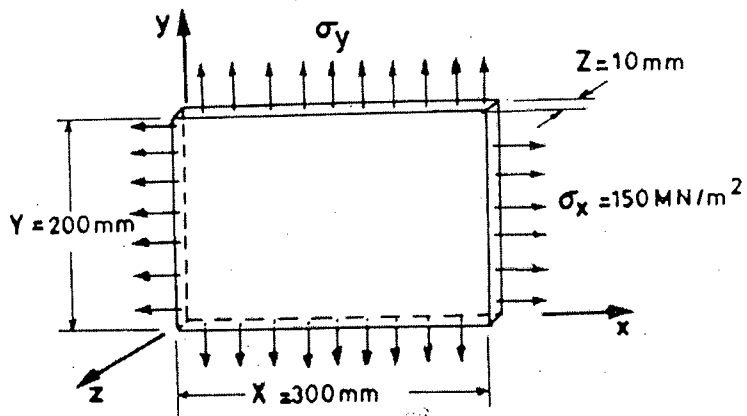
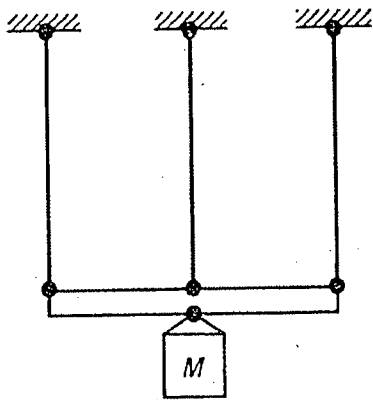**Fig. 5**
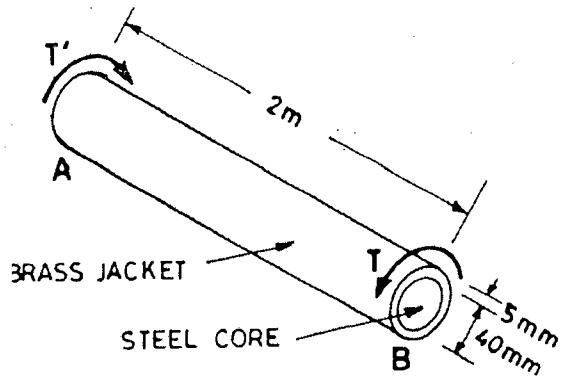
Fig. 6
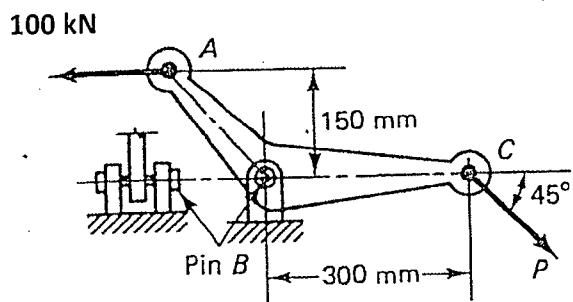
Fig. 7

Fig. 8
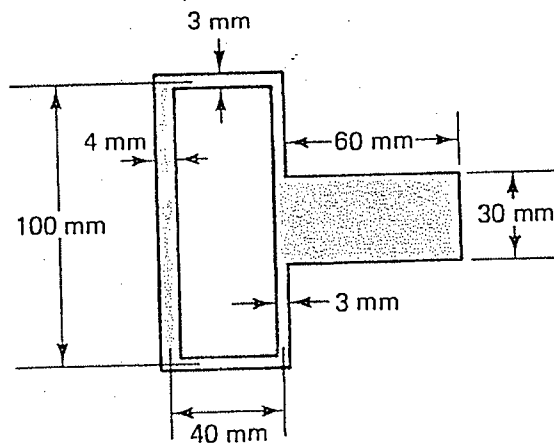
Fig. 9
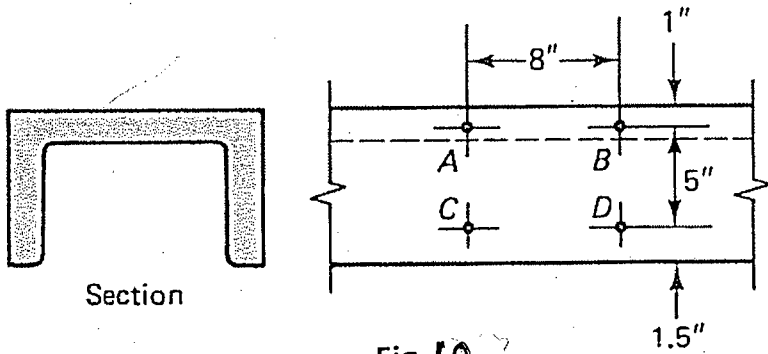
Fig. 10

## Table A (for Q.9)

Table of Coefficients for Rectangular Bars[17]

b/t	1.00	1.50	2.00	3.00	6.00	10.0	∞
α	0.208	0.231	0.246	0.267	0.299	0.312	0.333
β	0.141	0.196	0.229	0.263	0.299	0.312	0.333

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BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2015-2016

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

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**.

1. (a) Briefly describe the 'pith' and 'heartwood' of an exogenous tree. Compare the 'heart shakes' and 'radial shakes' types of defects of tree. Draw necessary diagrams.   **(5+5)**

(b) Write the objectives of timber seasoning. Compare between air drying/seasoning and water seasoning.   **(5+5)**

(c) Explain the effect of curing on the strength of concrete. Draw relevant typical graph.   **(10)**

(d) Compare the properties of cast iron and wrought iron with respect to the following basis: (i) Elasticity and (ii) tensile and compressive strength.   **(5)**

2. (a) Describe with neat sketches how ferrocement can be used to repair spalled concrete of floor slab. Why do you think such repair would reduce the changes of further spalling?   **(10)**

(b) Describe how reinforcement inside a reinforced concrete member (RC element) may be protected from corrosion.   **(10)**

(c) List the functions of varnish. Briefly describe different types of plastic tiles.   **(5+5)**

(d) List the tests for determining the mechanical properties of timber.   **(5)**

3. (a) Define proportional limit, elastic limit, yield point, ultimate strength and plastic flow zone. Draw necessary diagram.   **(10)**

(b) Write down the characteristics of strain components of a plastic material.   **(5)**

(c) For the following loading sequence (Fig. 1) draw the likely strain response with time of (i) a plastic material and (ii) an elasto-plastic material. Assume equal time interval i.e., $\nabla t = t_1 - t_0 = t_2 - t_1 = t_3 - t_2 = t_4 - t_3$.   **(15)**

Fig. 1.
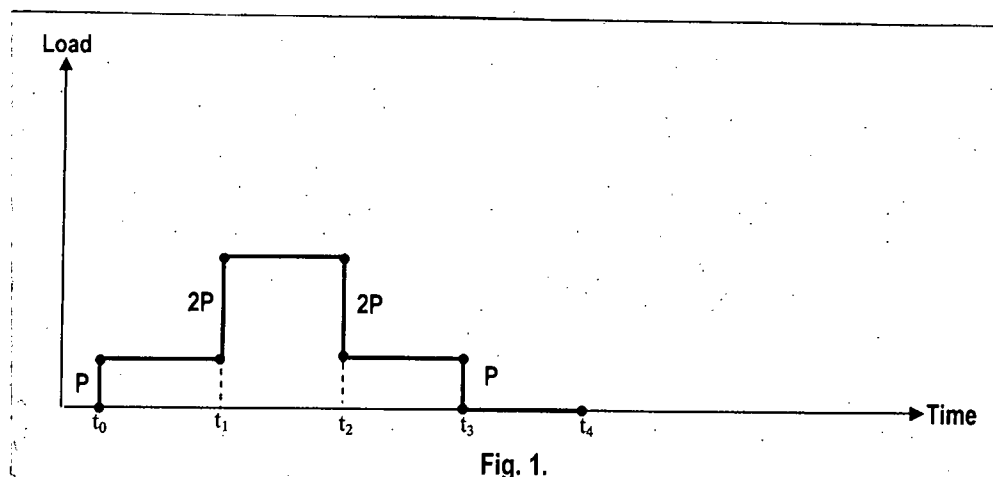
(d) Write the effects of Silicon and Sulphur on iron.   **(5)**

CE 201

4. (a) Explain the relation between (i) compressive strength and water-cement ratio of concrete and (ii) flexural strength and compressive stress at cracking for concretes made with different coarse aggregates. **(5+5)**

(b) What is admixture? Write the functions of retarders. **(5)**

(c) Determine the preliminary mix proportions of a concrete which is planned to be used for a column located above ground where substantial freezing and thawing may occur (consider air-entrained concrete). Use the following data. **(20)**

   (i) The 28-day compressive strength = 4,000 lb/in^2.

   (ii) The slump should be between 1 and 2 inch and the maximum aggregate size should not exceed $\frac{3}{4}$ inch.

   (iii) The properties of the materials are as follows:

   Cement: Specific gravity of cement = 3.15

   Coarse Aggregate:

   Bulk specific gravity (SSD) = 2.72

   Absorption capacity = 1%

   Dry-rodded unit weight = 100 lb/ft^3

   Surface moisture = 0%

   Fine Aggregate:

   Bulk specific gravity (SSD) = 2.67

   Absorption capacity = 1.3%

   Fineness modulus = 2.70

   Surface moisture = 3%

   Assume reasonable value for any missing data. Use Tables 1 to 5.

SECTION – B

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

Assume any reasonable value of missing data.

5. (a) Define hydraulicity? Why is it important for a cementing material? What else can you do if a lime is found to be devoid of this property? State the factors affecting hydraulicity of lime. **(3+2+3+3)**

(b) Describe the role of $Ca(OH)_2$ in C-S-H gel. How can you neutralize its bad effects in cement? Compare OPC and PCC in the perspective of bearing negative effects of $Ca(OH)_2$. **(15)**

(c) Why is curing important in cement product? Why is curing of column continued for longer period than that of masonry work? State the precautionary measures to be undertaken while using mortars. **(3+3+3)**

CE 201

6. (a) What is sulphate attack to cement concrete? What is the specialty of Sulphate Resisting Cement (SRC) over OPC in ingredients? State the beneficial effects of using SRC in construction. State five examples where SRC is suitable for use. **(5+3+4+3)**

    (b) Criticize the use of sea sand as fine aggregate in concrete. Evaluate, theoretically the minimum possible value of fineness modulus (FM) of a sand. **(8+4)**

    (c) Define bulking of sand. How does it occur? What is its importance in concrete mix design? **(3+2+3)**

7. (a) Write the disadvantages of using blocks or hollow bricks instead of conventional bricks in masonry walls. **(10)**

    (b) Write down the advantages and disadvantages of PPC or PCC over OPC. **(15)**

    (c) Damping of roof slab can be caused by two reasons: one is due to chemical imperfections in concrete materials and the other is due to physical imperfections in concrete materials. Describe briefly both the reasons. State remedial measures briefly. **(10)**

8. (a) Write the functions of different constituents of glass. Also state the functions of paint. **(10+5)**

    (b) Write five important requirements of each of the following: **(5×2)**

    (i) Thermal insulating material

    (ii) Sound insulating material

    (c) Compare between: **(5×2)**

    (i) Crude rubber and synthetic rubber

    (ii) Thermoplastic and thermosetting plastic.

Table 1. 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 structural walls	75(3)	25(1)
Beams and reinforced walls	100(4)	25(1)
Building columns	100(4)	25(1)
Pavement and slabs	75(3)	25(1)
Mass concrete	75(3)	25(1)

Table 2. Approximate mixing water (lb/yd^3) for different slumps and nominal maximum sizes of aggregates for **Non-Air-Entrained Concrete**

Slump (in)	Maximum aggregate size (in)							
	0.375	0.5	0.75	1	1.5	2	3	6
1 to 2	350	335	315	300	275	260	220	190
3 to 4	385	365	340	325	300	285	245	210
6 to 7	410	385	360	340	315	300	270	-
Air content	3%	2.5%	2%	1.5%	1%	0.5%	0.3%	0.2%

Table 3. Approximate mixing water (lb/yd^3) and air content for different slumps and nominal maximum sizes of aggregates for **Air-Entrained Concrete**

Slump(in)	Maximum aggregate size (in)							
	0.375	0.5	0.75	1	1.5	2	3	6
1 to 2	305	295	280	270	250	240	225	180
3 to 4	340	325	305	295	275	285	250	200
6 to 7	365	345	325	310	290	280	275	-
Air content								
Mild	4.5%	4.0%	3.5%	3.0%	2.5%	2.0%	1.5%	1.0%
Moderate	6%	5.5%	5.0%	4.5%	4.5%	4.0%	3.5%	3.0%
Extreme	7%	7.0%	6.0%	6.0%	5.5%	5.0%	4.5%	4.0%

Table 4. Percent of coarse aggregate to concrete for a maximum size and fineness modulus of aggregate

Maximum Aggregate size (in)	Fineness Modulus						
	2.4	2.5	2.6	2.7	2.8	2.9	3
0.375	0.50	0.49	0.48	0.47	0.46	0.45	0.44
0.500	0.59	0.58	0.57	0.56	0.55	0.54	0.53
0.750	0.66	0.65	0.64	0.63	0.62	0.61	0.60
1.000	0.71	0.70	0.69	0.68	0.67	0.66	0.65
1.500	0.75	0.74	0.73	0.72	0.71	0.70	0.69
2.000	0.78	0.77	0.76	0.75	0.74	0.73	0.72
3.000	0.82	0.81	0.80	0.79	0.78	0.77	0.76
6.000	0.87	0.86	0.85	0.84	0.83	0.82	0.81

Table 5. Relationship between water/cement ratio and compressive strength of concrete

28-day Compressive Strength (psi)	Non-AE	AE
2000	0.82	0.74
3000	0.68	0.59
4000	0.57	0.48
5000	0.48	0.40
6000	0.41	0.32
7000	0.33	---

Note: Non-AE: Non-Air-Entrained, AE: Air-Entrained Concrete

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1   B. Sc. Engineering Examinations 2015-2016

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** questions.

1. (a) What is matching principle and full disclosure principle according to Generally Accepted Accounting Principles (GAAP)? Define with example. **(4⅓)**

   (b) 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. **(4)**

   (c) "Aftab Automobile Agency" was opened at May 1, 2014. The following transactions occurred in the month of May-

   May 1: Mr. Aftab invested Tk. 700,000 cash in the business.

   May 2: Hired a employee at a monthly salary of Tk. 10,000.

   May 5: Paid advertising expense for the month in cash Tk. 5,000.

   May 6: Borrowed Tk. 100,000 in cash from a bank by signing notes payable.

   May 9: Earned revenue Tk. 90,000 by providing services, 50% of which received in cash and the remaining balance was on account.

   May 11: Purchased office equipment for Tk. 50,000; Paid Tk. 15,000 in cash and the remaining amount will be paid in a later date.

   May 14: Paid Tk. 20,000 in cash for utility expense.

   Required: **(15)**

      (i) Prepare a tabular summary for the month of May, 2014.

2. (a) What is a Ledger? Why is it important in recording process? **(5⅓)**

   (b) "Jamuna Electronics" started a business during January 1, 2015. The following transactions occurred in the month-

   January 1: Started business with cash Tk. 450,000 and also with an equipment value Tk. 150,000.

   January 3: Purchase a machinery for business on account Tk. 50,000.

   January 7: Earned revenue Tk. 85,000 of which Tk. 60,000 is collected in cash and the balance was due in January.

   January 9: Incurred salary expenses for the month in cash Tk. 8,000.

   January 11: Received an electricity bill for Tk. 10,000.

   January 13: Received Tk. 10,000 in cash from the customer.

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

January 15: Paid office rent in advance for next two months Tk. 20,000 in cash.

January 17: Paid Tk. 15,000 to account payable for machinery.

January 24: Service provided to a customer but not yet received Tk. 90,000.

Required: (18)

    (i) Give Journal entries for the month of January, 2015.

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

3. (a) Write down the prepayment category of adjusting entries, and identify the types adjustment applicable to each category. (4⅓)

(b) Sifat Ahmed started his business "Sifat Automobile" from 1st June, 2015. Following is the trial balance as on June 30, 2015.

"Sifat Automobile"

Trial Balance

June 30, 2015

Accounts Title	Debit (Tk.)	Credit (Tk.)
Cash	16,500	
Accounts receivable	4,000	
Prepaid insurance	2,400	
Supplies	1,500	
Office furniture	15,000	
Accounts payable		3,500
Unearned service revenue		6,000
Sifat, Capital		31,000
Service revenue		3,900
Drawings	2,000	
Salary expense	1,000	
Rent expense	1,000	
Utility expense	1,000	
Total	**44,400**	**44,400**

Other information:

➤ One third of the unearned service revenue has been earned at the end of the month.

➤ Salary accrued for the month of June Tk. 1,500.

➤ Insurance expires at the rate of Tk. 200 per month.

➤ Tk. 500 of supplies has been used during the month.

➤ Office furniture is being depreciated Tk. 200 per month.

Required: (19)

    (i) Prepare necessary adjusting entries.

    (ii) Prepare an adjusted trial balance as at June 30, 2015.

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4. (a) Define current liability. What basis is used for arranging individual items with in the current liability section?   **(5 ⅓)**

    (b) Following balances are extracted form the ledger balances of "M Company"   **(18)**

"M Company"

Trial balance

31st December, 2014

Accounts Name	Debit (Tk.)	Credit (Tk.)
Sales		320,000
Accounts payable		25,000
Wage payable		30,000
Note payable (for 5 years)		50,000
Unearned revenue		5,000
Accounts receivable	7,000	
Cash	50,000	
Prrepaid insurance	42,000	
Long term investment	10,000	
Inventory (31.12.2014)	23,000	
Rent expense	5,000	
Supplies	8,000	
Capital		300,000
Machinery	100,000	
Store equipment	200,000	
Cost of goods sold	50,000	
Utility expense	15,000	
Maintenance expense (office)	20,000	
Copyright	200,000	
Total	**730,000**	**730,000**

Adjustments data:

(i) 40% of utility expense is related to office and 60% related to sales.

(ii) Charge @ 10% depreciation on store equipment.

Required:

(i) Prepare a multiple step (classified) income statement for the year ended December, 2014.

(ii) Prepare an owner's equity statement and a classified balance sheet at 31st December 2014.

SECTION – B

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

5. (a) What is meant by a product's CM ratio? How is this ratio useful in planning business operation?   **(3 ⅓)**

    (b) Volter Company manufactures and sells a specialized cordless telephone for high electromagnetic radiation environments. The company's contribution formed income statement for the most recent year is given below: **(20)**

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

Sales (20,000 units @ Tk. 60)	Tk. 12,00,000
Less: Variable cost	9,00,000
Contribution margin	3,00,000
Less: Fixed cost	240,000
Net income	60,000

Requirements:

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

(ii) Compute the company's break-even point in both units and sales in 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 an 8% increase in sales.

6. (a) What is the basic difference between absorption costing and variable costing? **(3 ⅓)**

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

Selling price per unit	Tk. 60
Manufacturing cost:	
Direct materials per unit	Tk. 7
Direct labour per unit	10
Variable manufacturing over head per unit	5
Fixed manufacturing overhead in total	315,000
Selling and administrative costs:	
Variable cost per unit	Tk. 3
Fixed cost for the period	245,000

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Contd ... Q. No. 6(b)

Other information:

Units produced during the period	17,500
Units sold during the period	15,000

Requirements:

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

(ii) Prepare income statements under the both methods.

7. (a) The following information has been taken from the recording of Blue bird company: **(13⅓)**

Materials purchased	Tk. 100,000
Direct labour	200,000
Indirect labour	3,000
Salesman'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	420,000
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

Requirements:

(i) Prepare a cost of good sold statement and (ii) An income statement for the year.

(b) Electricity costs is explained by machine hours in Timber Assembly plant. Related information for a representative year is provided below: **(10)**

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

Requirements:

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

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

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

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8. (a) What are the purposes of cost allocation? (3 ⅓)

(b) Phonex consulting provided outsourcing services and advice to both government and corporate clients. For costing purposes, Phonex classifies its departments into two support departments (Human Resources and Information Systems) and two producing departments (government consulting and corporate consulting). For the first quarter of 2015, overhead costs across the departments and other data are given below:

	Support departments		Producing Departments	
	Human resource	Information system	Government consulting	Corporate consulting
Cost before allocation (Tk.) Service provided by:	600,000	24,00,000	87,56,000	124,52,000
Human resource	-	25%	40%	35%
Information system	10%	-	30%	60%

Requirements: (20)

You are asked to allocate the two support departments cost to the two producing departments using the following methods:

    (i) Direct method

    (ii) Reciprocal service method.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1   B. Sc. Engineering Examinations 2015-2016

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

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**.

1. (a) Why is earth called a dynamic planet? Discuss rates of geological events with examples.   **(12)**

    (b) Describe in detail different principles of geological formation.   **(15)**

    (b) Briefly describe different eras of geological time scale.   **(8)**

2. (a) What is the importance of sedimentary structures? Briefly describe various sedimentary structures with neat sketches.   **(19)**

    (b) Write short notes on (answer any four):   **(4×4=16)**

    (i)   Continental Glacier/Ice Sheet

    (ii)   Caldera

    (iii) Leen deposit.

    (iv)   Shale

    (v)   Mid ocean ridge

3. (a) What are the different types of plate boundaries? Discuss type of faulting and occurrence of earthquakes in such boundaries. Show neat sketches. **(17)**

    (b) Distinguish between, show figure and examples where applicable (answer any three):   **(6×3=18)**

    (i)   Intrusive and extrusive igneous rocks

    (ii)   Bottomset beds and foreset beds of delta

    (iii) Earthquake magnitude and intensity

    (iv)   Abrasion and Corrosion methods of sea erosion.

4. (a) What do you mean by orogeny? Briefly describe different types of mountains. **(12)**

    (b) With one neat sketch, show the formation of different types of folds. Briefly discuss practical engineering aspects of folds.   **(12)**

    (c) What do you mean by metamorphism? Describe the source of heat and pressure in metamorphism.   **(11)**

SECTION – B

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

5. (a) Define geomorphology. Why do Civil Engineers need to study geomorphology? Explain in the context of Bangladesh. **(11)**

   (b) Explain the following terms with respect to an alluvial floodplain: (i) Cut off, (ii) Meander neck, (iii) Back swamp. **(12)**

   (c) What is geomorphic process? What is geomorphic agent? Explain with examples in the context of Bangladesh. **(12)**

6. (a) Explain how the following channel properties vary as we move towards the downstream direction: (i) Channel width, (ii) Channel depth, (iii) Bed material grain size. **(15)**

   (b) What is river transportation? What are the factors affecting the transportation power of a river? What do you understand by "Capacity" and "Competence" in river transportation? **(20)**

7. (a) As an effect of urbanization in Dhaka, what sort of change do you expect in the over all condition of run off and ground water table? **(17)**

   (b) What is Rational Method? Why is it so popular? What are the shortcomings of it? List the assumptions of this method. **(18)**

8. (a) Write short notes on the following properties of minerals (answer any four): **(20)**
      (i) Cleavage, (ii) Streak, (iii) Tenacity, (iv) Hardness, (v) Transparency

   (b) What do you mean by silicate minerals? Briefly describe Felspar and Pyroxene group of minerals. **(15)**