L-3/T-1/CE **Date : 06/10/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 315** (Design of Concrete structure 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 **SEVEN** questions in this Section. **Answer Questions 2 and 3 and any THREE** from the rest. Assume appropriate value (s) for missing data.

1. Fig. 1 shows a cantilever beam and the cross section at the support. The concrete strength is 4000 psi and yield strength (f_y) of steel rebars is 60000 psi. The concrete is normal weight concrete.

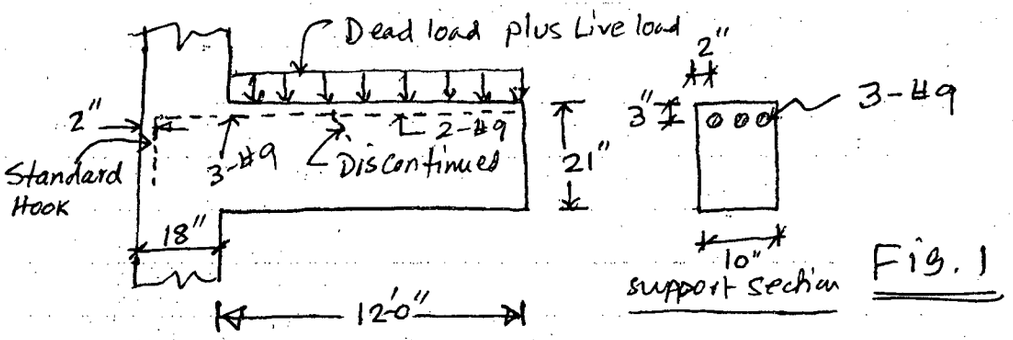

Fig. 1

Find the moment the will produce the first flexural crack at the top of the beam. Use moment of inertia 'I' for both gross area and uncracked transformed section and compare the results. (24) 21

2. (a) Explain the meaning of "over reinforced" and "Under reinforced" beams. **(5)**

(b) Determine the maximum moment for the support section of beam of Fig. 1, that can be carried without stressing the concrete beyond 0.45 f'_c and steel beyond 0.5 f_y. If the ratio of uniformly distributed dead load and live load is 2. Calculate the loads, that will produce the above moment at the support. ~~(19)~~ 16

3. (a) Give reasons for the provision of minimum cover requirements in the ACI code. **(5)**

(b) Compute the nominal flexural strength and the flexural strength to be used for design for the beam shown in Fig. 1. Compute the ratio of the flexural strength and the service capacity from 2(b). ~~(19)~~ 16

4. (a) Using the calculated dead load and live load of 2(b), compute the factored load (W_u) and the maximum moment due to factored loads (M_u), and sketch the shear force and bending moment diagrams. ~~(19)~~ 16

(b) Why higher load factor is used for live load compared to the dead load? **(5)**

Contd P/2

CE 315

5. (a) Where the reaction from the support introduces vertical compression to the beam, the maximum shear to be considered for design will be computed at a distance of 'd' from face of the support, explain why? **(6)**

   (b) What part of the beam of prob. 2(b) requires web reinforcement? Select stirrup size and calculate the stirrup spacing corresponding to the shear at a distance 'd' from face of the support and compare with the maximum spacing recommended by the ACI code. ~~(18)~~ 15

6. (a) Write down the factors that influence the development length of deformed tension rebars. ~~(8)~~ 7

   (b) Check to see if proper development length can be provided (in column) for top rebars of Fig. 1. Use the simplified equation for development length of rebars. ~~(16)~~ 14

7. (a) Explain, why every rebar shall be continued at least by a distance equal to the effective depth of the beam or 12 bar diameters (whichever is longer) beyond the point at which it is theoretically no longer required to resist stresses? ~~(8)~~ 7

   (b) Calculate the point where the middle bar of Prob. 2(b) can be discontinued. Check to be sure that adequate embedded length is provided for continued and discontinued bar. ~~(16)~~ 14

SECTION – B

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

8. (a) A roof slab is shown in Fig. 2 supported on brick walls. Design the slab and draw neat sketches of: **(26)**

   (i) plan showing reinforcement details.

   (ii) 2 sections (one through shorter direction and the other through longer direction) showing the details of rebars.

   Given: weight of lime terracing: 30 psf.

   Live load = 30 psf; $f_c' = 3000$ psi

   And $f_y = 40{,}000$ psi.

   (b) What is meant by temperature and shrinkage reinforcement? Discuss their importances mentioning the limitations for minimum amount and spacing of such reinforcements as per ACI/BNBC code. **(9)**

9. (a) A 16 ft, cantilever slab, 5" thick is supported by 3 inverted beams as shown in Fig. 3. The slab supports a floor finish (FF) = 25 psf and a live load (LL) = 100 psf. Design the middle beam for both flexure and shear. Given: **(20)**

   $f_c' = 3$, ksi; $f_y = 60$ ksi. Use USD.

Contd P/3

CE 315

Contd ... Q. No. 6

(b) Design a singly reinforced beam shown in Fig. 4. The dead load does not include self-wt of the beam. Given: **(15)**

$$f'_c = 3{,}500 \text{ psi}, f_y = 60{,}000 \text{ psi}.$$

10. (a) A rectangular concrete beam of width b = 24" is limited by architectural considerations to a maximum total depth h = 16". It must carry a total factored load moment Mu = 450 kip-ft. Design the flexural reinforcement for this member, using compression steel if necessary. Allow 3 inch to the centre of the bars from the compression or tension face of the beam. Material strengths are **(27)**

$$f'_c = 4000 \text{ psi}, f_y = 72{,}500 \text{ psi}.$$

(b) Show with neat sketches the following cracks in beam: **(8)**

(i) Shear crack, diagonal tension

(ii) Shrinkage cracks

(iii) Flexural cracks due to bending, and

(iv) Bond cracks.

11. (a) A tensile-reinforced T beam is to be designed to carry a uniformly distributed load on a 20 ft simple span. The total factored moment to be carried is M_u = 500 kip-ft. Concrete dimensions, governed by web shear and clearance requirements, are b = 20 inch; b_w = 10 inch; h_f = 5 inch and d = 20 inch. If f_y = 60 ksi and f'_c = 4 ksi, what tensile reinforcement is required at midspan? **(26)**

(b) Draw sketches for strain and stress distribution diagrams of a reinforced concrete beam section when subjected to bending for uncracked, cracked and ultimate condition. **(9)**

CE 315 for CE (Session-February,2013)

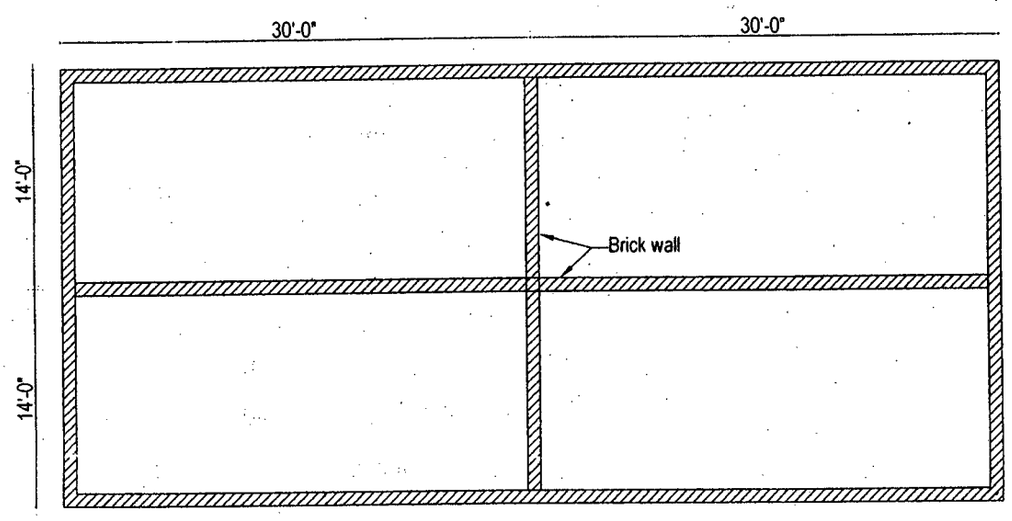

Fig- 2

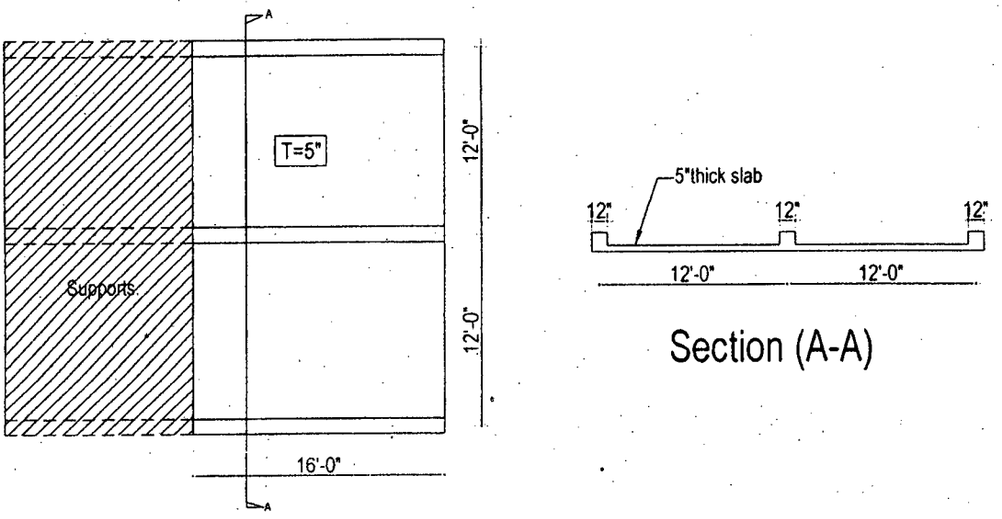

Fig- 3

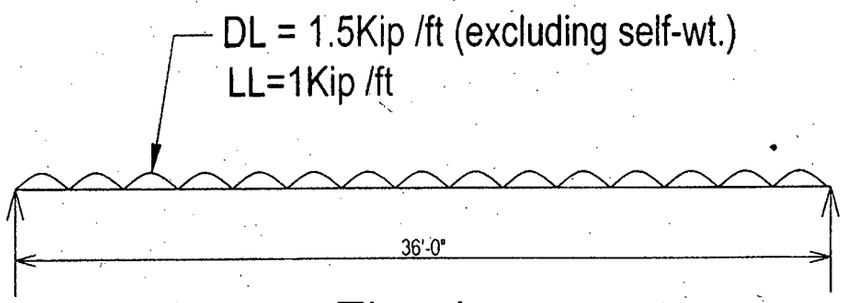

Fig- 4

L-3/T-1/CE **Date : 29/09/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 301** (Professional Practice and Communication)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) Distinguish between Act and Regulation. **(5)**

   (b) Describe the scope of applicability of PPA-2006. **(6)**

   (c) What is procurement plan? In a tabular format show what information is to be disclosed in a procurement plan? **(5)**

   (d) Name the different types of tendering methods. **(5)**

2. (a) Describe the tender process using a flow-chart. **(7)**

   (b) List the essential elements of a tender document. **(6)**

   (c) List, in order of priority, the documents that form the contract. **(5)**

   (d) List the events that are regarded as compensation events in a construction contract. **(3)**

3. (a) Why specification is important in a construction contract. **(4)**

   (b) Describe the attributes of good specification. **(6)**

   (c) Write a specification for concrete works in foundation. **(6)**

   (d) What features would you include in the specification of an electric generator? **(5)**

4. (a) What is the purpose of BoQ? **(3)**

   (b) In a standard format prepare a BoQ of the following work item: **(8)**

   Concreting work in foundation of a multi-storied building having 50 m^3 of work volume.

   (c) The quantity shown in BoQ is estimated quantity. If actual quantity varies significantly what contractual provision shall apply? **(5)**

   (d) State the standard contractual procedure to resolve the problem if any particular item of work is not included in the BoQ. **(5)**

5. (a) Prepare a notice inviting an expression of interest (EoI) for selection of an overseas consultant for the following work: **(10)**

   "Design and supervision of an airport construction project for handling wide body aircraft.

   (b) With suitable example show how the technical and financial score of firm 'A' and 'B' would be combined under QCBS method with a weightage of technical to financial as 70 : 30. **(6)**

   (c) Write essential steps for selection of consultant for intellectual service. **(5)**

Contd P/2

CE 301

6. (a) A tender data sheet is to be prepared for inviting a tender for construction of a 20 storied office building with an estimated cost of 100 crore taka. Prepare following TDS items: **(5×3=15)**

(i) Specific experience required, (ii) General experience required, (iii) Turnover required, (iv) Tender security required, (v) Credit facility/Liquid asset required.

(b) List the conditions for which the tender security of a bidder can be forfeited. **(6)**

7. Write short notes on: (a) Arbitration, (b) Post qualification, (c) Arithmetic correction, (d) Front loading, (e) JVCA. **(21)**

SECTION – B

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

8. Describe the three broad categories of communication activities or formal communication channels of an organization. **(21)**

9. (a) Define Civil Engineers. What are the necessary professional outcomes of civil engineering education? **(3+8)**

(b) Describe five basic attributes of civil engineering profession. **(10)**

10. (a) What is a project? Briefly describe Scope - Schedule - Budget relationship of a project. Show graphically various stages of a construction project. **(2+5+5)**

(b) "Managing project life cycle is complex" - explain. **(9)**

11. (a) Graphically show the flow of work in project development. **(5)**

(b) Describe purposes, activities and deliverables of the pre-design phase of the project development. **(10)**

(c) Briefly explain inferring and abstracting. **(6)**

12. (a) What issues are required to be considered during contract formation. Briefly describe each of the issues. **(9)**

(b) Write short notes on : (i) Conventional proposal (ii) Multiple contracts (iii) Model contracts (iv) Contract interpretation **(12)**

13. (a) What is professional liability insurance? Define Insureds, Insurers, Actuaries, Under-writers, and Reinsurers. **(2+5)**

(b) Write short notes on: (i) General liability insurance (ii) Common types of bonds (iii) Dealing with contract risk (iv) Fiduciary risk **(14)**

14. (a) Briefly explain the following terms: **(2+2)**

(i) Miscommunication instruction (ii) Slender attitude

(b) Describe in brief the following of the ~~sever~~ seven C's of effective communication

(i) Consideration (ii) Concreteness (iii) Correctness **(8+5+4)**

L-3/T-1/CE Date : 23/09/2013

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 331** (Environmental Engineering 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**.

Semi-log paper is supplied.

1. (a) What do you mean by the term "Climate Change"? Briefly explain the causes of climate change. What are the general impacts of climate change in Bangladesh? **(18)**

   (b) A 300 mm diameter well in a water table aquifer is being pumped at a rate of 1500 *l*/m with a drawdown of 8 m. The static depth of water in the well is 40 m. During pumping, the depth of water in a similar well, not being pumped situated at a distance of 6 m is 37 m. At what rate could water be pumped from the two wells, if both the wells are being pumped together with a drawdown in each well of 7.5 m? **(17)**

2. (a) State the purposes of pumps in water supply system. What are the different types of pumps according to the mechanical principles of operation? What are the advantages and disadvantages of centrifugal pumps? **(18)**

   (b) For water supply of a town, water is pumped from a river 1 km away into a reservoir. The maximum level difference of river and reservoir is 20 m. The population of the town is 40,000 and the water demand is 100 lpcd. Calculate the horsepower of the pumping unit, of the pump operates for a total of 8 hours and the efficiency of the pump is 70%. Assume friction factor as 0.01, velocity of flow as 2 m/s and maximum daily demand as 1.5 times average daily demand. **(17)**

3. (a) What are the sanitary significance of the following impurities in water? **(8)**

   (i) Sulfate, (ii) Turbidity, (iii) DO and (iv) Manganese

   (b) Show the variation of Carbonic Acid Species (H_2CO_3, Bi-carbonate, carbonate etc.) with pH value. **(6)**

   (c) What are the advantages of 'Break Point Chlorination'? How does THMs formation can be controlled in a 'chlorination' process? **(8)**

   (d) Under which environmental conditions soda ash is used and re-carbonation is required in a 'Precipitation Softening' process? **(6)**

   (e) Distinguish between 'Coagulation' process & 'Flocculation' process? **(7)**

Contd P/2

CE 331

4. (a) Explain the mechanism of removal of Manganese through 'Catalytic Contact Oxidation and Sorption' processes with equation? **(14)**

(b) Design a tube well with the following sieve analysis data of a soil sample: **(21)**

Sieve No.	Sieve Size (mm)	% material retained
30	0.60	0.5
40	0.425	1.0
50	0.30	4.4
100	0.15	64.8
200	0.075	27.1
Pan	—	2.2

The diameter of the well strainer is 100 mm and the opening area of the strainer is 15% of the total surface area of the strainer.

SECTION – B

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

5. (a) What are the sources of the following impurities in water? **(10)**

(i) E. Coli (ii) Chromium (iii) CO_2 and (iv) NO_3

(b) What are the factors affecting Iron oxidation and precipitation processes? **(9)**

(c) What are the advantages of "inclined parallel plates separator" over single storied "plain settling tank"? Show with diagram. **(6)**

(d) What are the two main objectives of "Aeration" process and how does gas transfer between air-water interface can be maximized? **(10)**

6. (a) How does "Reverse Osmosis" process differ from "Electro-dialysis" process? **(5)**

(b) Briefly explain with diagram the mechanisms of removal of microorganisms from water in a "Slow sand filtration" process. **(10)**

(c) What are the two alternative methods of Arsenic removal from low iron ground water through "Co-precipitation" process? **(8)**

(d) What is a water safety plan? State (with brief description) the flow diagram to prepare a water safety plan. **(12)**

Contd P/3

CE 331

7. Tabulated below are census figures for a town in Bangladesh for the period 1970 to 2010. Estimate the population for 2020 by the least square parabola method. **(35)**

Year	1970	1980	1990	2000	2010
Population (thousands)	50.0	58.0	63.8	85.8	110.2

Also estimate water for Fire demand for the year 2013. according to Kuichling, how many fire streams may be called into use at the same time in the town for the present situation?

8. (a) Discuss various water distribution systems with their merits and demerits. **(10)**

(b) What are the basic assumptions made in the Hardy-cross method of computing flow distribution in a network of pipes? **(5)**

(c) Discuss briefly dead-end layout system of water distribution network. **(10)**

(d) Calculate the most economic dimensions for a cylindrical overhead water tank of capacity 0.20 million gallons (US). **(10)**

L-3/T-1/CE **Date : 25/07/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 311** (Structural Analysis and Design I)

Full Marks: 280 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

The questions are of equal value.

1. (a) Find axial force in member AF, MD, MH and DH for the truss shown in Fig. 1.

2. Draw shear force and bending moment diagrams for the members of the frame shown in Fig. 2. Given: M_A = 300 k-ft (anti-clockwise direction).

3. (a) Determine hanger force of the suspension bridge shown in Fig. 3.
   (b) Draw shear force and bending moment diagrams for the stiffening girders of the bridge

4. For the truss shown in Fig. 4, compute horizontal component of the deflection of joint "F". Assume E = 30,000 ksi, A_1 = 10 in^2 for horizontal members and A_2 = 15 in^2 for vertical and diagonal members.

5. Compute vertical deflection at "B" (point of concentrated load) due to the loads shown in Fig. 5. Assume E = 30,000 ksi, I = 200 in^4 for segment "AB" and I_2 = 300 in^4 for segment "BC".

6. Calculate change in slope at point "D" due to the loads shown in Fig. 6. Assume E = 30 × 10^3 ksi. A_1 = 15 in^2 (for AB) and A_2 = 10 in^2 (for BD). Moment of inertia given in Fig. 6.

7. Determine vertical deflection of point "D" of the frame shown in Fig. 7. Assume the followings–

   E = 30000 ksi

   I_1 = 400 in^4 for columns

   I_2 = 600 in^4 for beam

   A_1 = 15 in^2 for columns

   A_2 = 20 in^2 for beam.

Contd P/2

CE 311

SECTION – B

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

The questions are of equal value. Assume reasonable values for any missing data.

8. The beams of the building frame shown in Fig. 8 are subjected to uniform vertical dead load of 6 kip/ft and live load of 4 kip/ft. Using approximate method, draw bending moment diagrams for all the beams and columns of the frame. Also determine the maximum possible bending moment in the column BF. EI is constant and same for all the columns. Draw diagrams on compression side. **(28)**

9. Calculate the vertical distribution of earthquake forces for a 24 m high 8-storied hospital building with equal story height for Dhaka city. The structural system will be special moment resisting frame in steel (R = 12). The building will be 30 m × 30 m in plan. Use equivalent static force method as per BNBC. **(28)**

   Given: Dead Load = 7 kN/m^2 for each floor

   Partition wall load = 3 kN/m^2 for each floor

   Z = 0.15; I = 1.25; site coefficient, S = 1.5;

   C_t = 0.083; C<2.75 and $\frac{C}{R} > 0.075$

   Notations convey their usual meanings.

10. Using portal method draw bending moment diagram of the frame shown in Fig. 9. Also draw shear force diagrams for the girders. Bending moment diagram shall be drawn on compression side. **(28)**

11. Using approximate method determine the bar forces in the truss shown in Fig. 10. Diagonals can carry compression. **(28)**

12. For the beam shown in Fig. 11, draw influence lines for (a) moment at A (b) shear just right of support at B (c) shear just left of support at B and (d) reaction at B. **(28)**

13. Calculate the force in the counter U_2L_3 of the truss shown in Fig. 12 due to a moving UDL of 3 kip/ft accompanied by a roving concentration of 60 kip. The dead load of the truss is 1.5 kip/ft. **(28)**

14. Due to the wheel loading shown in Fig. 13, calculate the maximum moment at a distance 20 ft from left support of a simply supported beam of 80 ft span. **(28)**

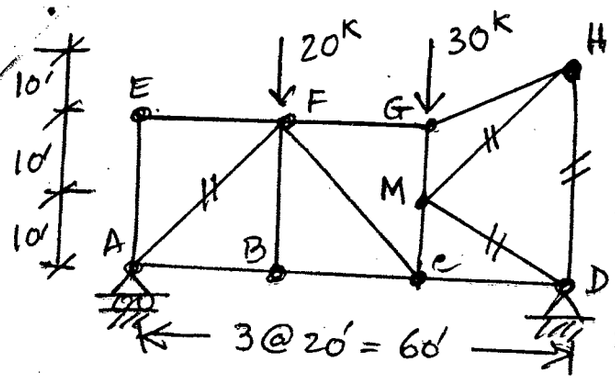

Fig. 1
(Q. no. 1)

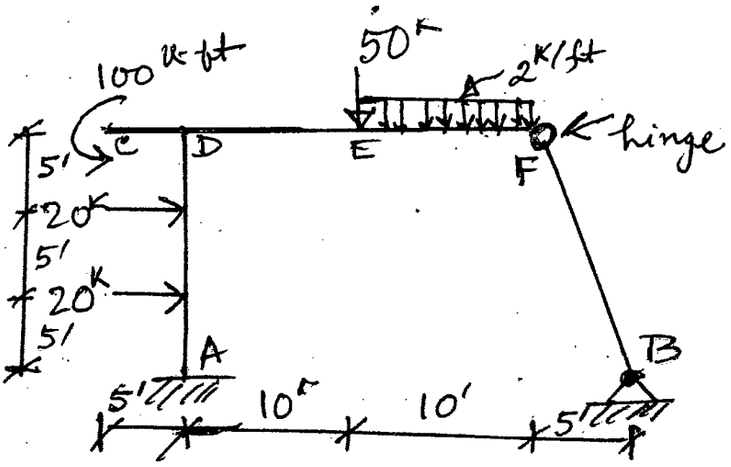

Fig. 2 (Q. no. 2)

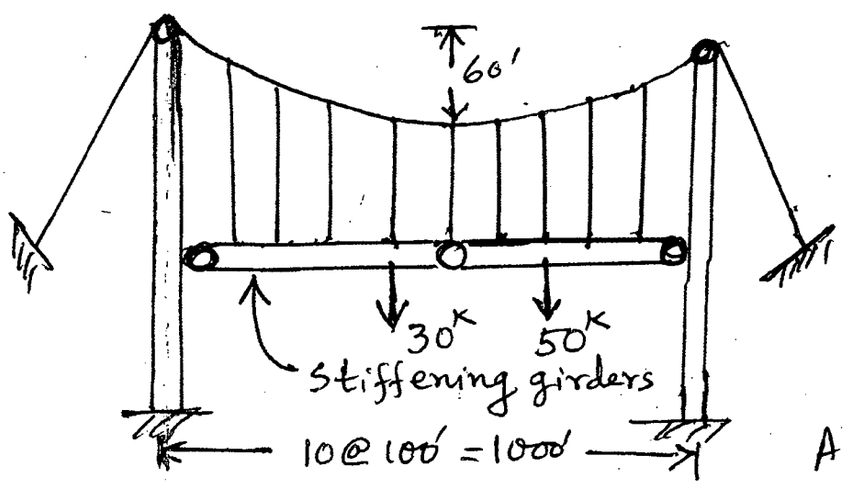

Fig. 3 (Q. no. 3)

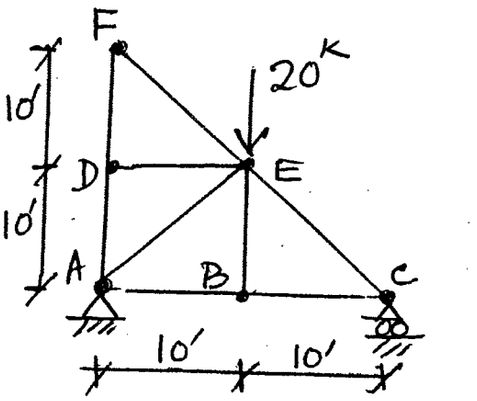

Fig. 4 (Q. no. 4)

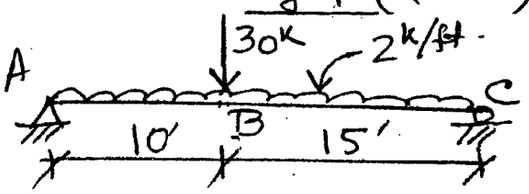

Fig. 5 (Q. no. 5)

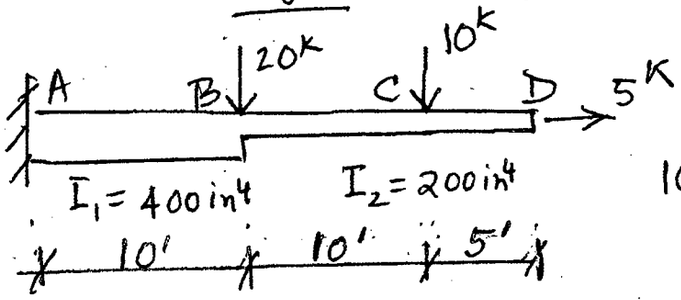

Fig. 6 (Q. no. 6)

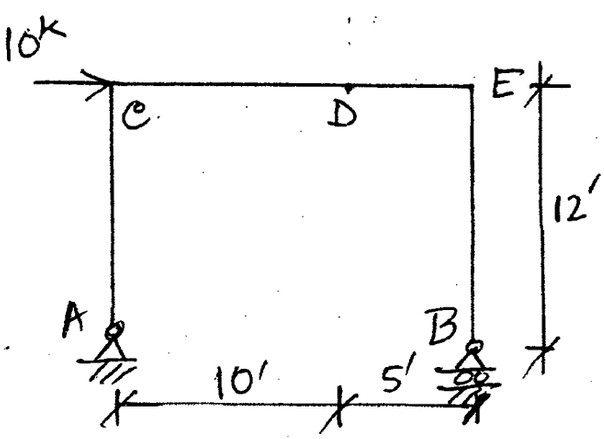

Fig. 7
(Q. no. 7)

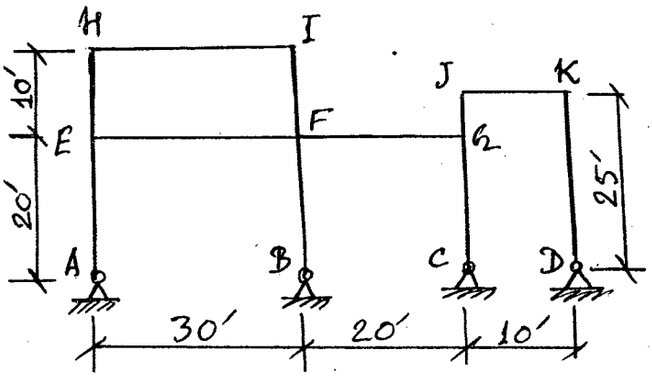

Fig. 8 (Q.no.8)

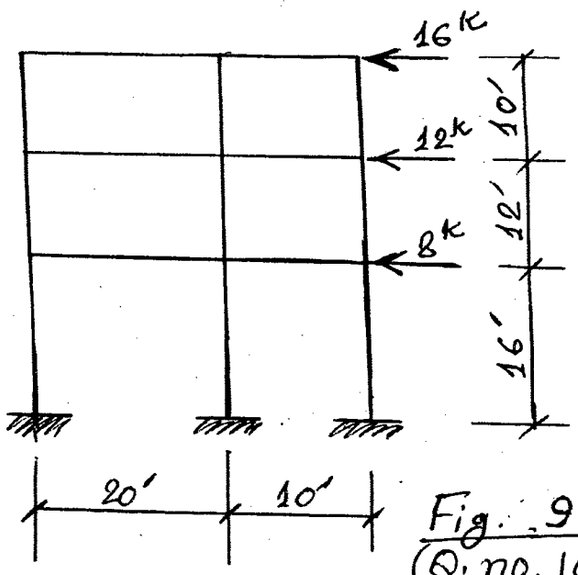

Fig. 9
(Q.no.10)

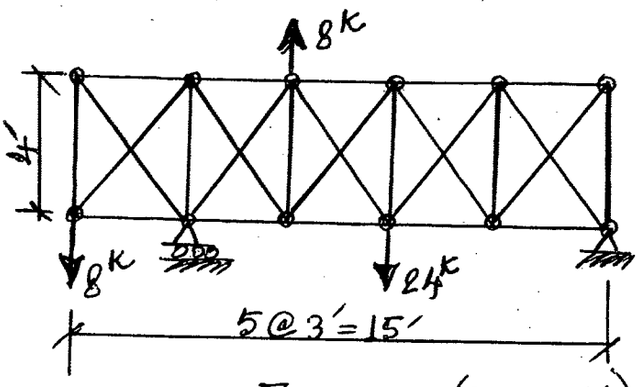

Fig. 10 (Q.no.11)

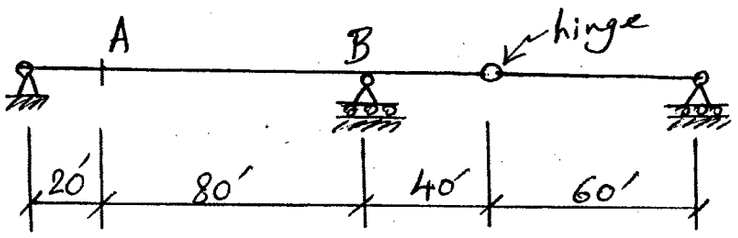

Fig. 11 (Q.no.12)

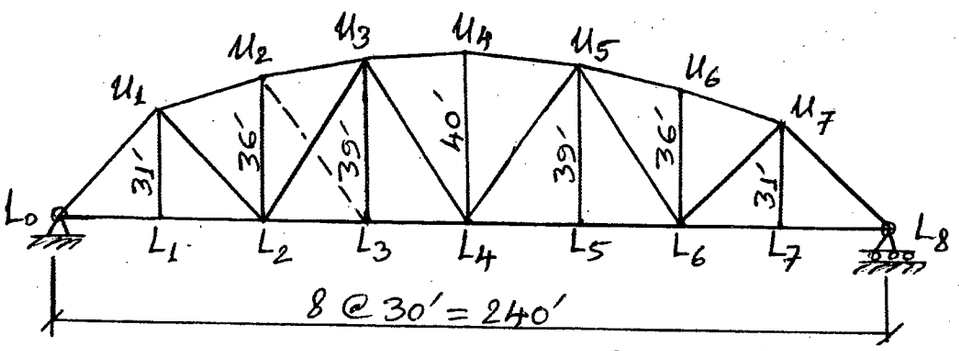

Fig. 12 (Q.no.13)

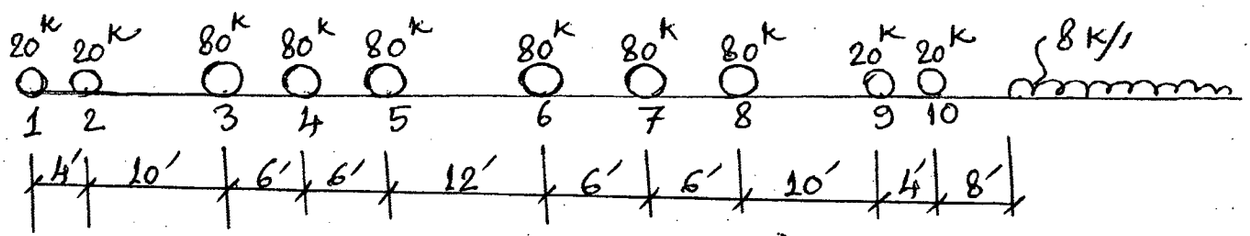

Fig. 13 (Q.no.14)

10-9-13

L-3/T-1/CE **Date : 08/07/2013**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 341** (Principles of Soil Mechanics)

Full Marks : 280 Time : 3 Hours

The figures in the margin indicate full marks.

Assume reasonable value(s) of any data, if any.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer **Q. No. 1** and any **TWO** from the rest.

1. (a) Define transported soil. Name the major type of transported soil and describe how each is formed. **(10)**

   (b) How would you classify the history of geotechnical engineering? Cite at least one example of geotechnical importance for each of a classification age. **(10)**

   (c) The three major categories of Bangladesh soil are found is seven physiographic tracts. Name the categories of soil, and also the physiographic tracts mentioning the administrative locations of each of the tracts. **(10)**

   (d) Distinguish between Soil Mechanics and Geotechnical Engineering. Explain briefly the various aspects of Geotechnical Engineers. **(10)**

2. (a) Grain size distribution curves for four soils A, B, C and D are shown below in Fig. 1, and LL and PL values are : soil C = 40, 16; soil D = 62, 34. Classify soil A using USCS and soil D using AASHTO soil classification system. What would be the broad classification of soils B and C as per USCS? **(25)**

   (b) Derive an expression for co-efficient of active earth pressure in a cohesionless soil using Rankine's method. Show also the orientation of failure plane. Write down the expression for active earth pressure in a c-ϕ soil and hence deduce a formula of theoretical unsupported soil for a purely cohesive soil. **(25)**

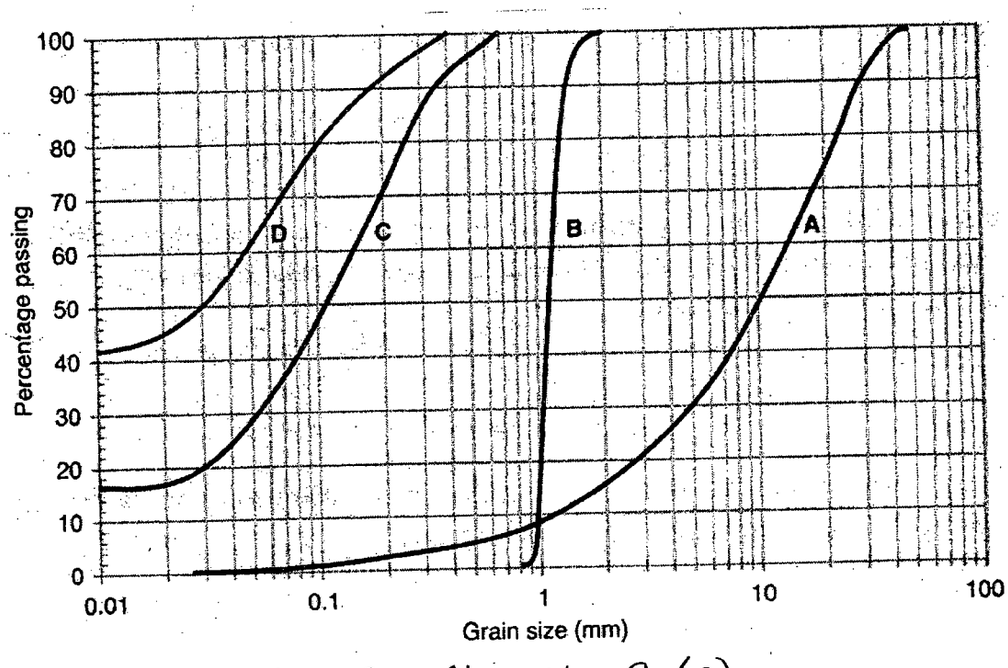

Fig. 1 for Question No. 2 (a)

Contd..... P/2

CE 341

3. (a) A series of consolidated undrained triaxial tests were carried out on three identical saturated clay specimen. The results are: **(25)**

Specimen No.	Cell Pressure (kPa)	At failure (kPa)	
		Deviator stress	Pore pressure
1	100	170	40
2	200	260	95
3	300	360	135

Determine c, ϕ, c′ and ϕ' using Mohr's circles.

(b) A dockside retaining wall 10 m high retains a non-cohesive backfill with a horizontal surface level with the top of the wall. The properties of the backfill materials are: γ_{sat} = 18.5 kN/m^3, ϕ = 32°. An additional superimposed load of 30 kN/m^2 is indicated at the surface of the backfill due to construction of warehouses and dockyard traffic. Compute the lateral thrust on the wall when the water table is 2 m below the level surface. You are free to make reasonable assumptions for any missing data. **(25)**

4. (a) In an experiment for the determination of shrinkage limit, the following observations were taken: **(25)**

(i) Volume of saturated soil = 9.75 ml

(ii) Mass of saturated soil = 16.5 gm

(iii) Volume of dry soil after shrinkage = 5.40 ml

(iv) Mass of dry soil after shrinkage = 10.9 gm

Compute the shrinkage limit and specific gravity of soil solids.

(b) A boring log reveals that a thin layer of silty clay exists at a depth of 15 m below the ground surface. The soil above this layer is silt with γ_{dry} = 15.5 kN/m^3, γ_{sat} = 19.8 kN/m^3 and water content = 28%. The ground water table is found to exist nearly to the ground surface. Triaxial tests on the undisturbed silty clay samples give the following results: **(25)**

c_{cu} = 48.3 kN/m^2, ϕ_{cu} = 13° and

c'_d = 41.4 kN/m^2, ϕ'_d = 23°

Estimate the shearing resistance of the silty clay on a horizontal plane (i) when the shear stress builds up rapidly and (ii) when the shear stress builds up very slowly.

Contd ....., P/3

CE 341

SECTION – B

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

5. (a) What is preconsolidation pressure? In what way its determination is important in foundation design practice? How can you estimate its value if you know the value of unconfined compressive strength and plasticity index of clay at a given depth. **(3+3+4=10)**

(b) A rigid foundation block circular in plan and 5.0 m diameter rests on a bed of compact sand 5.0 m deep. Below the sand, there is 1.6 m of clay overlying impervious bed rock. Ground water table is 1.5 m below the top surface of the sand. The unit weight of sand above ground water level is 19.2 kN/m^3, the saturated unit weight of sand is 20.8 kN/m^3 and the saturated unit weight of clay is 20.0 kN/m^3. The foundation block is subjected to a uniform pressure of 200 kN/m^2. Draw the schematic diagram of the described problem.

A laboratory consolidation test on an undisturbed sample of clay, 20 mm thick and drained top and bottom, gave the following results:

Pressure (kN/m^2) :	50	100	200	300	400
Void ratio :	0.73	0.68	0.63	0.58	0.54

(i) Calculate the final settlement of the foundation, assuming that load spread may be taken as 1 horizontal to 2 vertical. **(26⅔)**

(ii) If the consolidation of the test sample reached 90% consolidation in 110 minutes, how long will it take the foundation to reach 90% of its final settlement? **(10)**

6. (a) What is time factor? How it is related to average degree of consolidation? Write down the steps for determining the time-settlement curve in the field. **(10⅔)**

(b) The void ratio of clay 'A' decreased from 0.572 to 0.505 under a change of pressure from 120 to 180 kN/m^2. The void ratio of clay 'B' decreased from 0.612 to 0.597 under the same pressure increment. The thickness of sample 'A' was 1.5 times that of 'B'. Nevertheless the time required for 50% consolidation was three times longer for sample 'B' than for sample 'A'. What is the ratio of coefficient of permeability of 'A' to that of 'B'. **(18)**

(c) In falling head permeability test method, head causing flow was initially 50 cm and it drops by 2 cm in 5 minutes. How much time required for the head to fall 25 cm? **(18)**

Contd P/4

CE 341

7. (a) Write down the expression for vertical stress (σ_z) at a point due to a point load, Q on the surface of elastic medium (soil) as a function of z and r; where z is the depth of soil and r is the radial distance. For given 'r', find the depth 'z' at which σ_z will be maximum. **(10⅔)**

(b) A natural soil sample of 150 m^3 with $G_s = 2.70$ has a mass density of 2.00 ton/m^3 at a water content of 8%.

(i) Calculate the additional volume of water required to be added to raise the water content to 11% from 8%.

(ii) What will be the degree of saturation at 12% moisture content?

(iii) Calculate volume of water required to make 100 m^3 of above dry sample fully saturated. **(18)**

(c) Calculate analytically the increase in vertical stress, σ_z at a depth 8 m below the interior corner point 'P' due to a 'L' shaped building in plan Fig. 1 that exerts a pressure of 75 kN/m^2. **(18)**

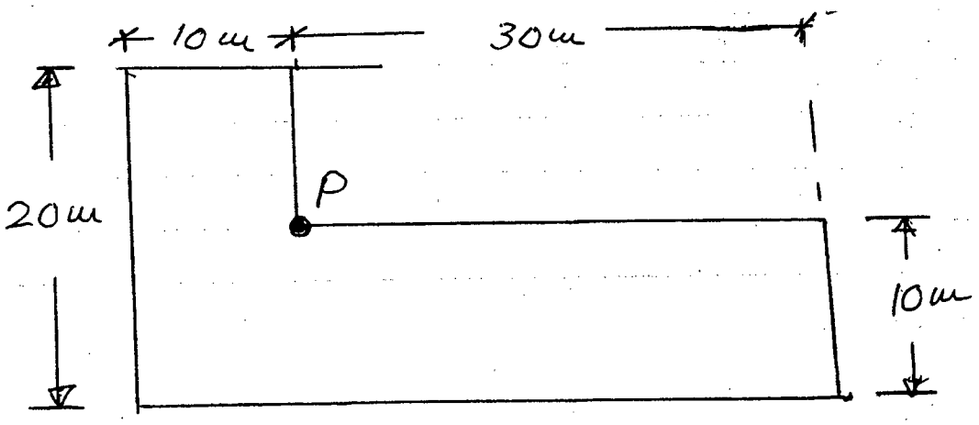

Fig 1 for Question 7(c)

8. (a) Define discharge velocity, seepage velocity and seepage pressure. **(9)**

(b) What is graded filter? When and where it is used? **(5)**

(c) Write down the typical values of coefficient of permeability of coarse sand, fine sand and clay. **(6)**

(d) Write down the typical values of capillary rise in meter for coarse sand and clay. **(4)**

(e) Draw the flow net diagram for the problem shown in Fig. 2. Also calculate the seepage loss in 6 month for unit width of hydraulic structure. Given $K = 2.5 \times 10^{-4}$ m/sec. **(22⅔)**

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CE 341

Contd ... Q. No. 8(e)

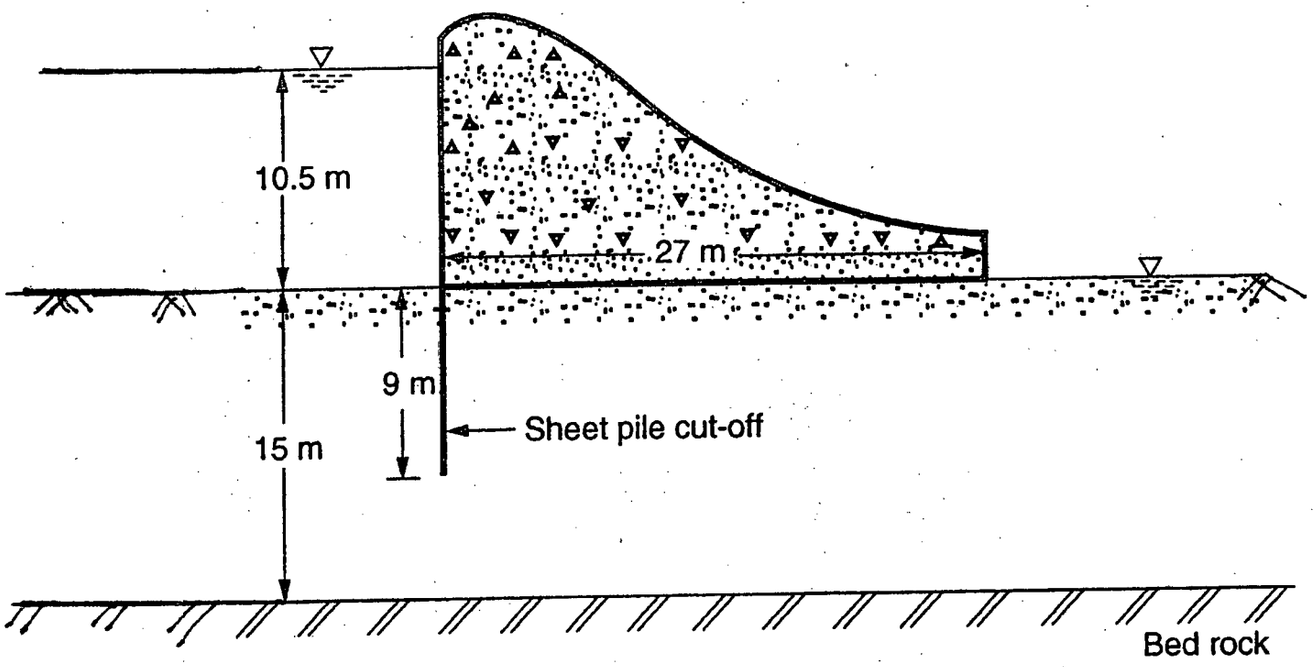

Fig. 2 for Question 8(e).

P.S You may draw flow net diagram on Fig. 2 in this page and attach this with the answer scripts.
