Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 3rd Year 2nd Term Regular Examination, 2017

BECM 3201

(Construction and Project Management II)

Full Marks: 210 Time: 3 hrs

N.B. i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

1. (a) What is project management? Describe the importance of project management for the construction industry. (15)

   (b) The technical and socio-cultural dimensions of project management are two sides to the same coin. Explain. (10)

   (c) What is portfolio management? Write down the major functions of portfolio management. (10)

2. (a) Describe the core functions of project management. (10)

   (b) Why project managers need to understand their mission and strategy? (10)

   (c) Define strategic management process. Describe the major components of the strategic management process. (15)

3. (a) Distinguish between project definition workshop and kick off meeting. (05)

   (b) List down the standard agenda for a typical workshop at start-up phase. (10)

   (c) The chances of risk events occurring and their respective cost vary over the project life cycle. Explain (10)

   (d) When would it be appropriate to hold a formal team-building session on a project? (10)

4. (a) Why is the principled negotiation approach recommended for negotiating agreements on project? (10)

   (b) What are the unique challenges to manage a virtual project team? (10)

   (c) What is culture shock? Describe cultural shock cycle. How can you avoid cross cultural pitfall? (15)

Section – B

5. (a) Define project and project monitoring. Write down the steps of project monitoring. (08)

   (b) Define earned value and earned value analysis. Why earned value analysis is important in project management? (08)

   (c) Write short notes on cost performance index and cost schedule index. Draw earned value chart. (09)

   (d) A building construction project is 10 days behind schedule at day 70. It had a (10)

planned cost of TK 800000 for this point in time, but the actual cost is only TK 600000. Estimate the schedule variance, cost variance and cost schedule index. Also re-estimate the variances and cost schedule index if the actual cost had been TK 850000.

6. (a) Define conflict and conflict management. Based on the aspects of the conflict write down the various causes of conflict. (08)

(b) Write down the characteristics of functional and dysfunctional conflict. Also state some recommended solutions for major sources of conflict in different phases of project. (11)

(c) Define quality control and quality assurance. Write down the basic steps in creating a quality assurance plan template. (07)

(d) Suppose you are managing a building construction project. The project is expected to be completed in 8 months at a cost of TK 10000 per month. After 5 months, you realize that the project is 70% completed at a cost of TK 80000. Interpretate the status of the project after 5 months by calculating performance indices and drawing graphical representation. (09)

7 (a) Define project control. Write down the purposes of project control. (06)

(b) Write short note on (i) crash time (CT) (ii) crash cost (CC) and (iii) crash point (12)

(c) Write short note on cybernetic project control system. (05)

(d) The precedence and durations are given in Table-1 shows the normal schedule for a project. You can decrease (crash) the durations at an additional expense. The time-cost information for the activities is also given in the Table-1. To shorten the project by four weeks, which tasks would be shortened and what would the final total project cost be? (12)

Table-1: Time-Cost information for the activities

Activity	Preceding Activities	Required Time (Weeks)		Cost (TK)	
		Normal	Crash	Normal	Crash
A	–	4	2	10000	11000
B	A	3	2	6000	9000
C	A	2	1	4000	6000
D	B	5	3	14000	18000
E	B,C	1	1	9000	9000
F	C	3	2	7000	8000
G	E,F	4	2	13000	25000
H	D,E	4	1	11000	18000
I	H,G	6	5	20000	29000

8 (a) Define project audit. Write down the typical steps in a project audit. (06)

(b) Prepare a mid-term audit report for a building construction project which have a budgeted cost at TK. 1000000 with a total project duration 8 months. Also consider at the time of mid-term 40% construction works are completed at a cost of TK 600000. (10)

(c) Define project termination. Describe the common ways for terminating a project. (08)

(d) Define project closeout. Write down the process of project closeout. (06)

(e) Define project review. When do you complete a project review? (05)

Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 3rd Year 2nd Term, Regular Examination, 2017

BECM 3205

(Acoustics and Lighting)

Full Marks: 210 Time: 3 hrs

N.B. i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

1. (a) What is the difference between echo and reverberation? Show it with necessary sketches. (10)

   (b) Describe the behavior of sound in your classroom during lecture hour with neat sketches. (10)

   (c) Show the differences of sound quality between a room with acoustical treatment and a room with no acoustical treatment with necessary sketches. (05)

   (d) Discuss about the working mechanism of acoustical solution in a room with mezzanine and connected rooms. Provide necessary sketches. (10)

2. (a) Describe the working procedure of hybrid system as an application for sound absorbing materials. (05)

   (b) Describe the reverberation time. A classroom, 80ft long by 50ft wide by 15ft high has sound absorption coefficient α's of 0.30 for walls, 0.04 for ceiling and 0.10 for floor. All α's are at 600 Hz. Find the reverberation time T at 600 Hz if 65% of the ceiling surface (along the perimeter of the room) is treated with acoustical panels at α of 0.85. (15)

   (c) How to solve acoustic problem in rectangular space with different types of ceiling shapes? Describe it with necessary sketches. (10)

   (d) What is free field? Write down the uses of reverberation room in acoustics. (05)

3. (a) What is amphitheater? Describe the design criteria of an amphitheater for solving the acoustical problem with necessary sketches. (15)

   (b) Give proper acoustic solutions for a narrow room and a large room with low ceiling. (06)

   (c) What are the design considerations of a large hall (auditorium) in solving acoustical problem? (04)

   (d) Explain the properties of sound absorbing, sound defusing and sound reflecting materials. (10)

4. (a) Which component is called cloud in designing the acoustical solution in auditorium? Describe the purposes of cloud with necessary sketches. (08)

   (b) How room volume, room shape, absorption, floor, ceiling and wall affect in designing an auditorium for achieving better sound quality? (17)

   (c) Why Greek theatre of Epidaurus is renowned for? What were the major challenges for Epidaurus to overcome the acoustical problems? And what were the solutions? Explain. (10)

Section – B

5. (a) What is light in Architecture? How spirituality and emotion can be expressed through design? (15)

   (b) A designer should consider the relevant climate condition while designing a building – do you agree or disagree? Define your answer with necessary example. (15)

   (c) What is Top Lighting? Discuss the different types of Top Lighting with sketches. (05)

6. (a) A building facing west is to be lighted by a natural light, show with sketches how you can get in diffused light by avoiding direct sunlight. (15)

   (b) Illustrate different types of artificial lighting according to their function. (15)

   (c) Explain the surface action of light with neat sketches. (05)

7. (a) A designer should consider the relevant climatic condition while designing a building. Do you agree or disagree? Define your answer with examples. (15)

   (b) Write short note on given topics: (12)

   (a) Glare (b) Landscape Lighting (c) General Diffuse Lighting

   (c) A production area in a factory measures 60 meters X 30 meters, and 20 lamps is required to illuminate the area. If each lamp has a Lighting Design Lumen (LDL) output of 15000 lumens then find the illumination required for the factory. (08)

   Where, Utilization Factor = 0.3, Lamp Maintenance Factor = 0.75.

8. (a) Define the design strategies and effect of Landscape Lighting which work as a guideline for designing the outdoor space of a building. (15)

   (b) Discuss about – Indirect lighting, Semi direct lighting and Utilization factor. (3x5)

   (c) Evaluate the function of Artificial Lighting. (05)

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B. Sc. Engineering 3rd Year 2nd Term Regular Examination, 2017

CE 3211

(Structural Analysis and Design-II)

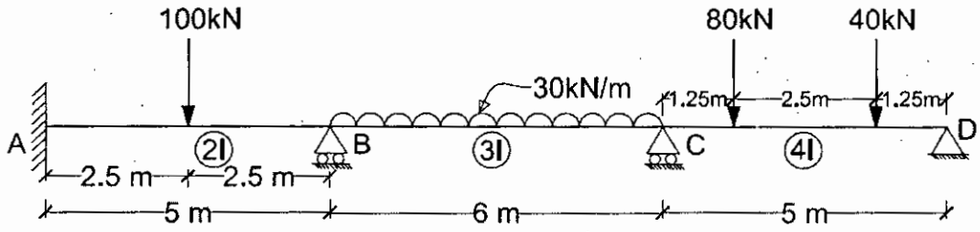
Full Marks: 210 Time: 3 hrs

N.B. i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

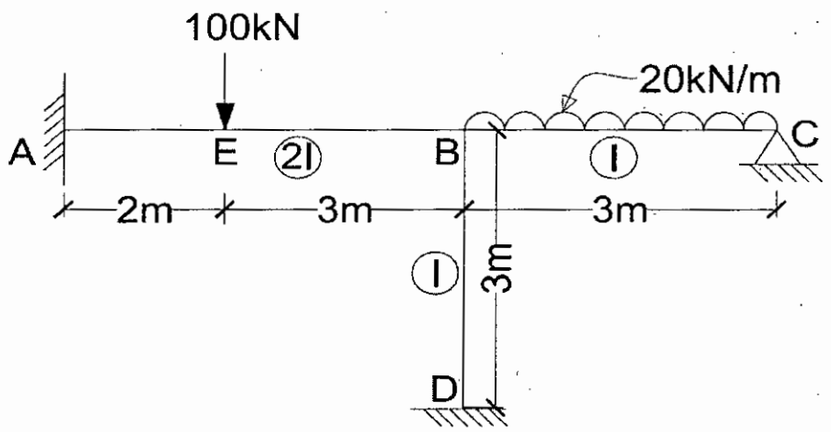
1. (a) Define distribution factor and carry over factor? Show that the stiffness of a member AB at near end is 4EI/L, where the end B is fixed. Also show that the moment at B is $\frac{1}{2}M_{AB}$. (06)

(b) Analyze and sketch the shear force and bending moment diagram for the beam shown in figure. The values of the second moment area of each span are indicated along the members. Modulus of elasticity is constant. Use moment distribution method. (29)

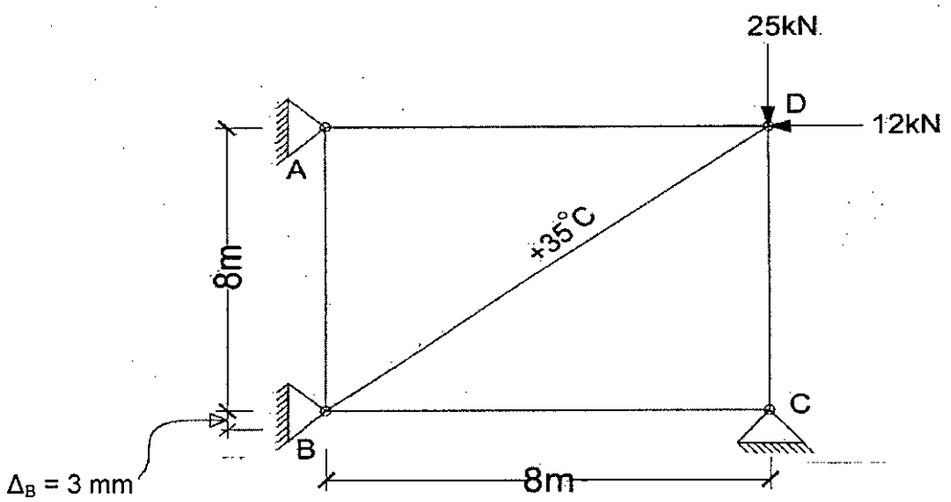


2. (a) What is folded plate structure? Describe the advantages and disadvantages of folded plate roofs over shell roofs? (06)

(b) Analyze the frame by moment distribution method. Draw the shear force and bending moment diagram. (29)



3. For the truss shown below, use the stiffness method to: (35)
(i) Determine the deflections at the loaded joint.
(ii) Determine the end forces of each member and reactions at supports.
The support *B* settles downward 3.0 mm. Temperature in member *BD* increases 35°C. Take $\alpha = 12\times10^{-6}/°C$, $AE = 8\times10^{3}$ kN.



4. (a) Describe briefly the following term those are related with dynamic seismic analysis of structure: (17)

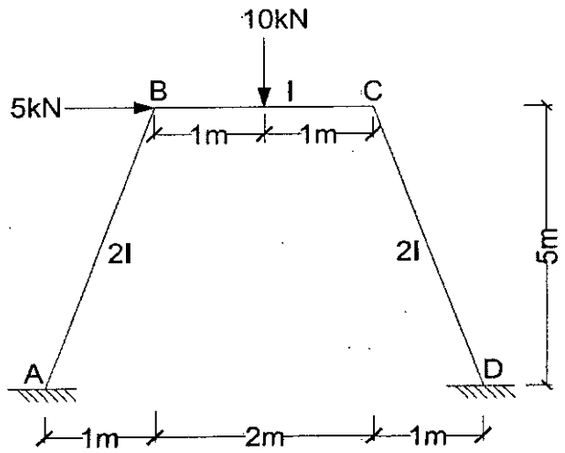
(i) Participation factor (ii) P-Δ effect (iii) Story drift (iv) Natural period and frequency (v) Elastic response spectrum (vi) Inelastic response spectrum

(b) Using the equivalent lateral force response spectrum method to calculate the base shear and story drift of a five-storied reinforced concrete building. Also, check the allowable story drift. The following data are given below: (18)

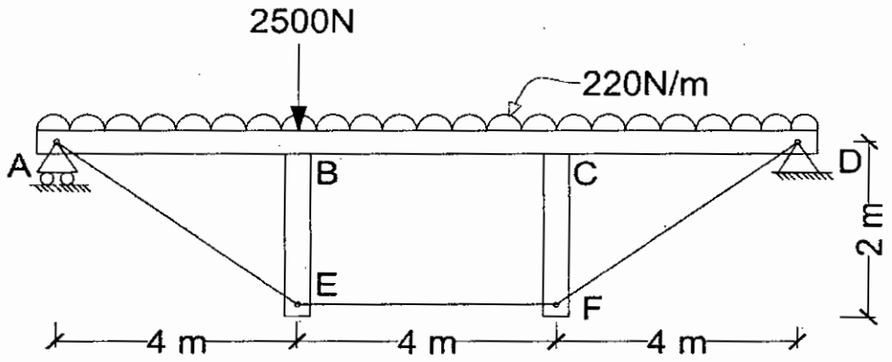
- S_s = 1.5g, S_1 = 0.60g, F_a = 1.0 and F_v = 1.5
- Total building height = 54 ft
- Building period of co-efficient, C_T = 0.02
- Structural importance co-efficient I_E = 1.0
- Site class D – stiff soil profile
- Total seismic dead load = 8970 kips
- Deflection amplification factor C_d = 5.0
- Response modification factor R = 6.0
- Displacement (δ_{xe}) obtained by the 3-D static elastic analysis from top to ground stories are 0.39, 0.31, 0.22, 0.14 and 0.06.

Section – B

5. Determine the moment at each joint of the frame by slope deflection method. Moment of inertia of all the members is shown in the figure. Also draw the bending moment diagram of the frame. (35)

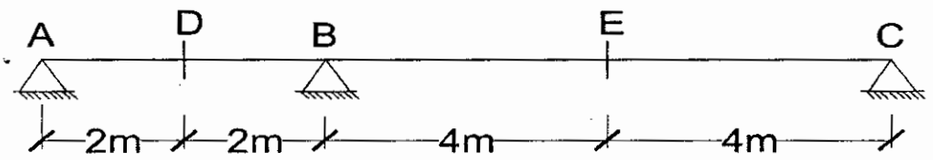


6. Find the forces in the struts and tie rods of the following structure. Diameter of each tie rod is 2cm and each strut is 10cm x 10cm. The beam ABCD is 12cm x 20cm. E for steel is 2 x10^5 N/mm^2 and that for timber is 1x10^4 N/mm^2. (35)

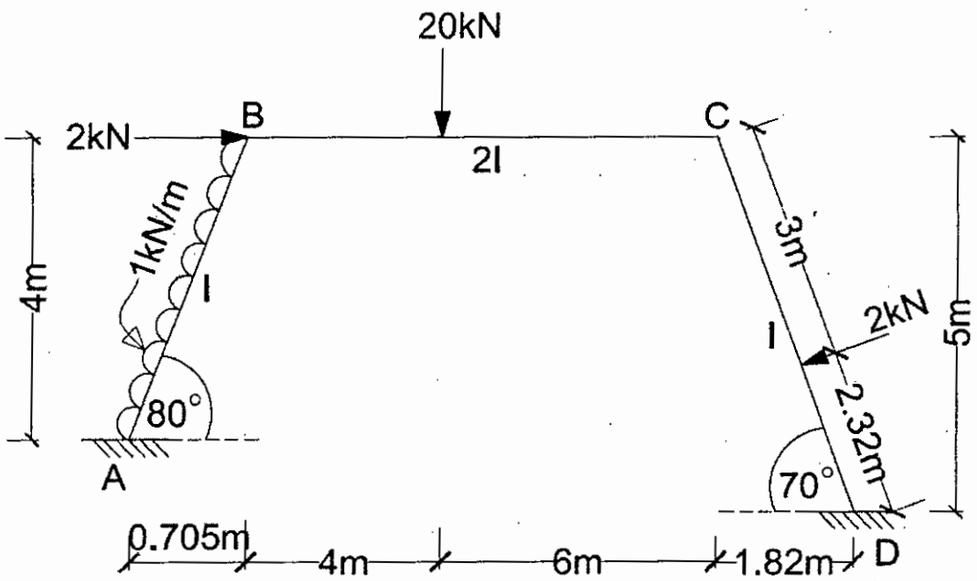


7. (a) List the general steps of the finite element method, and also list four types of commercial finite element programs. Write down the applications of the finite element method in Building Engineering. (17)

(b) Draw the influence line for the vertical reaction at B, shear at D and bending moment at E of the following beam at a interval of 2m. EI is constant. (18)



8. Define stiffness and flexibility. Analyze the following frame by method of consistent deformation. Take E as constant and use product integrals. No table or chart will be provided. (35)



Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 3rd Year 2nd Term Regular Examination, 2017

CE 3213

(Reinforced Concrete Structures-II)

Full Marks: 210 Time: 3 hrs

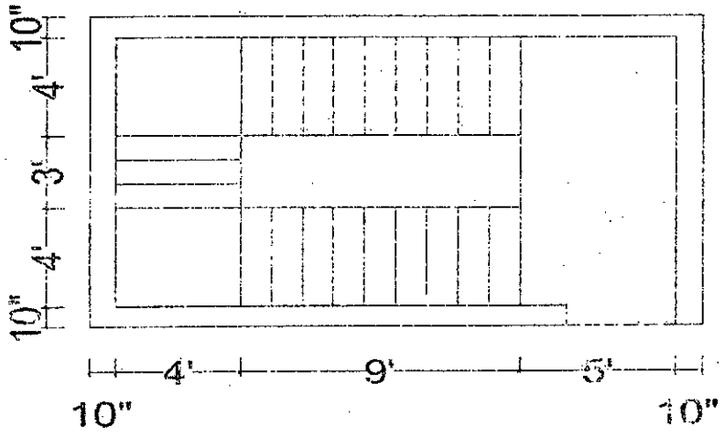
N.B. i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

1. (a) What are the limitations to the flat slab systems designed by the direct design method? (05)

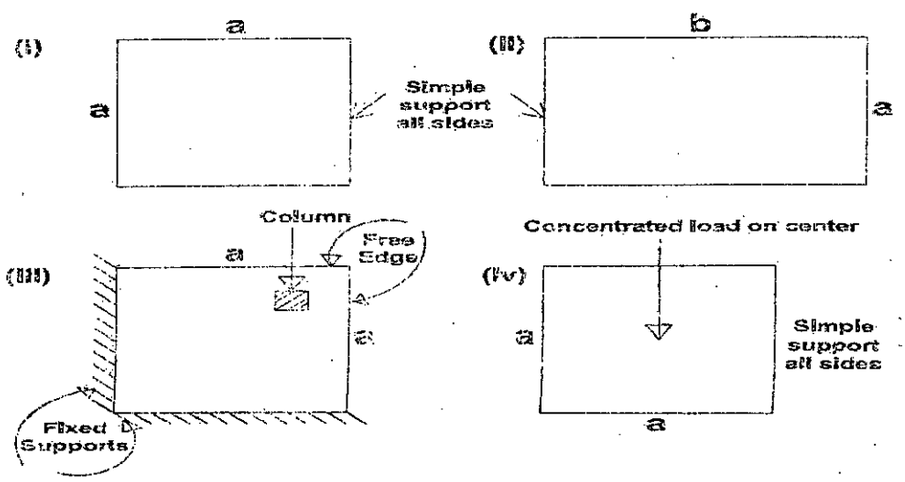
   (b) Design the corner panel of a flat slab system having column spacing of 24 ft c/c in both directions. Columns are 15"x15" having capital of 3 ft square and drop of 8 ft. square with 3" more thickness than other part of the slab. Assume that the crushing strength of concrete cylinder is 3000 psi, yield strength of steel is 60000 psi, live load is 100 psf and floor finish is 25 psf. Show reinforcement details. (30)

2. Design the stair case shown in figure below. Consider f_c' = 3000 psi, f_y = 60000 psi, live load on stair is 80 psf and floor finish load is 25 psf. Floor to floor height of this system is 10'-0". Show reinforcement details. (35)



3. A building is designed using a flat plate floor system is composed of slab panels measuring 24 ft x 20 ft. Beams, drop panels and column capitals are not permitted. Specified live load is 60 psf and dead load will include the weight of the slab plus 25 psf for floor finish plus suspended loads. Masonry wall of 5 inch thick continuous along the grid lines. The column will be 24 inch square, and the floor to floor height of the structure will be 11 ft. Design the interior panel, using materials strengths f_c' = 3000 psi and f_y = 60,000 psi. (35)

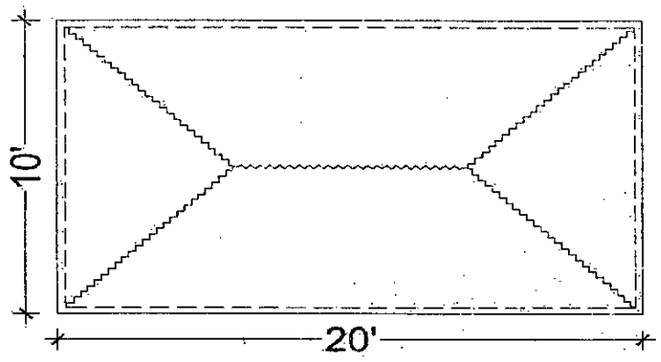
4. (a) Draw the typical yield line patterns for the following structures: (08)



(b) Analysis the external work done by loads and internal work done by resisting moments. (07)

(c) Write down the rules of yield line. (05)

(d) The two-way slab shown in figure below is simply supported on all four sides and carries a uniformly distributed load of W psf. Determine the require moment resistance for the slab, which is to be isotropically reinforced. (15)

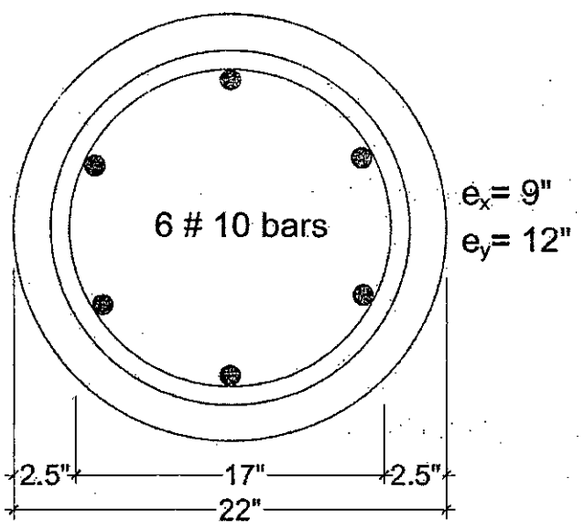


Section – B

5. (a) Describe why the strength reduction factor for a column is more conservative than those for a beam. (05)

(b) Write down the ACI code limitations of slenderness ratio for nonsway and sway frames for RC long column. (05)

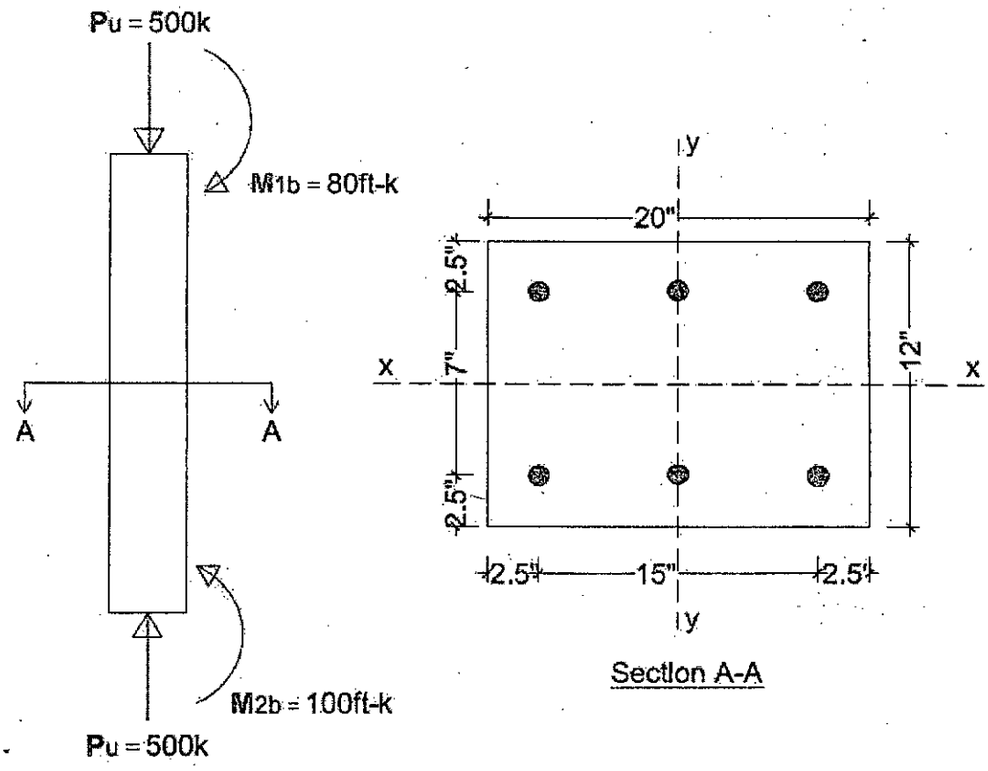
(c) Use the appropriate interaction diagrams to determine the P_n values for the short round circular columns shown in figure, which have bending about both axis if e_x = 9 in. and e_y = 12 in. Assume f_y = 60,000 psi and f'_c = 4000 psi. Use USD method. [Necessary graph will be supplied] (25)



6. (a) How the slenderness ratio effects on the load-deformation behavior of reinforced concrete long column. Explain with suitable examples. (05)

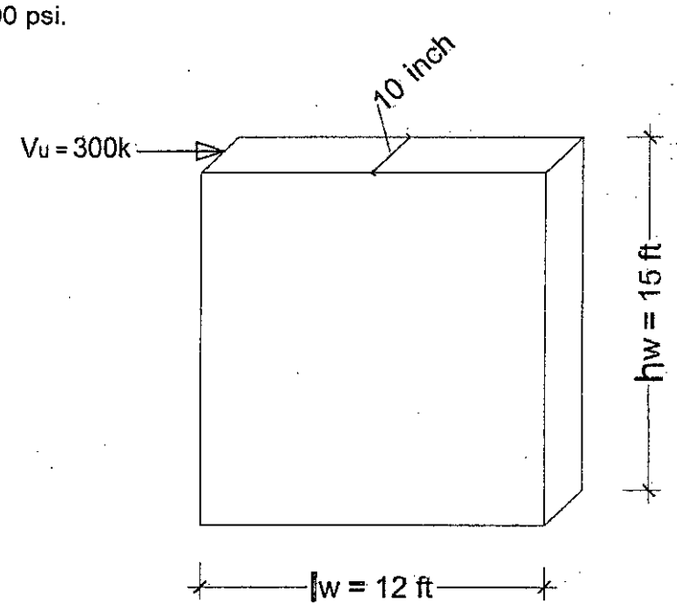
(b) Write down the ACI code requirements for the lateral ties of a short column. (07)

(c) Select the reinforcing bars for the braced tied column, as shown in figure. The reinforcement will be placed in two faces where the distance from the column edge to the center of the bars is 2.5 in. The rectangular column is bent in single curvature about their strong axis and it has an l_u of 16 ft. Also note that the unfactored dead axial load P_D is 120k. If k = 0.80, f_y = 60 ksi, and f'_c = 4 ksi. Use the ACI equation for low percentage of steel for EI. [Necessary graph will be supplied] (23)



7. (a) What is the difference between a column and shear wall. Why are shear walls provided in buildings? (07)

   (b) Design the reinforced concrete shear wall shown in figure if f_c' = 3000 psi, and f_y = 60,000 psi. (28)



8. (a) A reinforced concrete column is required to carry an axial load of 1200 kN. The architectural drawing restricts the dimension of the column to 300mm x 300mm. Design the column by WSD method with permissible compressive stress in concrete is 28 MPa, and yield stress in steel is 350 Mpa. Initially assume ρ = 0.02. (15)

   (b) Explain the plastic hinge characteristics of a reinforced concrete member from the typical moment-curvature diagram. (07)

   (c) What is "Engineered Timber"? Write down the process of timber treatment. (07)

   (d) Write down the properties and uses of timber. (06)

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 3rd Year 2nd Term Regular Examination, 2017
CE 3223
(Soil Mechanics)

Full Marks: 210 Time: 3 hrs

N.B. i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

1. (a) What do you mean by soil and soil mechanics? Write down the applications of soil mechanics in building engineering and construction management sector. (10)

   (b) Why do you need to study the formation of soil? Briefly describe the rock cycle with figure. Describe the soil formation process with diagram. (13)

   (c) Draw the residual soil profile. Describe the ASTM and MIT soil classification system. (12)

2. (a) Define soil phase system with figure. Using phase diagram proof that $\gamma_d = \frac{G_s \gamma_w}{1+e}$, where the symbols bear the usual meanings. (10)

   (b) Define the following terms: (i) Void ratio, (ii) Porosity, (iii) Degree of saturation, (iv) Specific volume, (v) Air content and (vi) Specific gravity. (12)

   (c) A new site has been selected for the construction of KUET Auditorium building; where a loose, uncompacted sand fill of 7.15 ft in depth having a relative density of 39.5%. Given, e_{max} = 0.92 and e_{min} = 0.48*emax. (i) Compute the density of the sand at site. (ii) If the sand is compacted to a relative density of 63%, compute the decrease in thickness of the fill? (13)

3. (a) Define relative density. Classify soil according to relative density. Explain why Atterberg limits are so significant. (10)

   (b) Define the following terms: Soil consistency, Liquid limit, Plastic limit and Shrinkage limit. How can you determine liquid limit using Fall Cone Method? (12)

   (c) What do you mean by activity of clay? Describe Casagrande plasticity chart. (13)

4. (a) What is soil compaction? Narrate the effects of compaction on permeability and swelling. (10)

   (b) Following are the results of a filed unit weight determination test performed on the soil by sand-cone method: (14)
   - Calibrated dry density of Ottawa sand = 1570 kg/m^3
   - Calibrated mass of Ottawa sand to fill the cone = 0.565 kg
   - Mass of jar + cone + sand (before use) = 8.69 kg
   - Mas of jar + cone + sand (after use) = 4.78 kg
   - Mass of moist soil from hole = 3.907 kg
   - Moisture content of the moist soil = 13.2%

   Determine - (i) In place dry density.
   (ii) If the maximum dry density is equal to 20 kN/m^3 in lab, calculate relative field compaction.

(c) Why do we study the theory of lateral earth pressure? Define active and passive earth pressure. What are the factors affecting lateral earth pressure? (11)

Section – B

5. (a) Define permeability. State the factors that affect the co-efficient of permeability. (07)

(b) State the names of different types of laboratory and field tests to determine the co-efficient of permeability. Deduce an expression to determine permeability co-efficient from valuable head permeability test. (10)

(c) What is flow net? Derive $q = k_h(\frac{N_f}{N_d})$, where the symbols bear the usual meanings. (08)

(d) A stratified soil deposit consists of four layers of equal thickness. The co-efficient of permeability of 2nd, 3rd and 4th layer are $^1/_3$, ½ and 2 times of the co-efficient of permeability of top layer. Compute the average permeability of the deposits, parallel and perpendicular to the direction of the stratification in terms of the permeability of the top layer. (10)

6. (a) Define: (i) Total sress (ii) Effective stress and (iii) Pore water pressure. (06)

(b) Prove: $\Delta\sigma = \Delta\sigma' + \Delta u$. Write down the limitation of Terzaghi's formula. (10)

(c) Show that "There is no change of effective stress due to the rise of water table whether it is at or above the ground surface". (07)

(d) A 5 m depth of sand overlies a 6 m thick layer of clay, the water table being at the surface: the permeability of the clay is very low. The saturated unit weight of sand is 19 kN/m^3 and that of the clay is 20 kN/m^3. A 4 m depth of fill material of unit weight 20 kN/m^3 is placed on the surface over an extensive area. Determine the effective vertical stress at the centre of the clay layer: (a) immediately after the fill has been placed, assuming this to take place rapidly, and (b) Many years after the fill has been placed. (12)

7. (a) Explain Mohr-Coulomb failure criteria. (10)

(b) Distinguish between CU and CD test procedure. (06)

(c) Draw the graphical representation of Mohr-Coulomb failure criteria for (i) General case, (ii) Granular (non-cohesive) soils and (iii) Saturated, plastic clay. (07)

(d) What are the objectives of slope stability analysis? Describe different types of slope failure. (12)

8. (a) Derive: $\frac{\delta u}{\delta t} = C_v(\frac{\delta^2 u}{\delta z^2})$. 12)

(b) Define pre-consolidation pressure. Describe the Casagrande method of estimating pre-consolidation pressure from 1D consolidation test results. (10)

(c) For a normally consolidate clay layer in the field, the following values are given: Thickness of clay layer = 8.5 ft, Void ratio = 0.8, Compression index = 0.28. Average effective pressure on the clay layer = 2650 lb/ft^2, $\Delta\sigma' = 970$ lb/ft^2. Secondary compression index = 0.02. What is the total consolidation settlement of the clay layer five year after the completion of primary consolidation settlement? (Note: Time for completion of primary settlement = 1.5 years). (13)
