Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 3rd Year 1st Term Regular Examination, 2017
BECM 3101
(Construction and Project Management I)

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 meant by "Project" and "Project Management"? Write down the (08) characteristics of a project.

(b) How the role of a project manager influences the project activities? Briefly discuss (12) about the skills of a good project manager.

(c) A project consists of five activities: (15)
   (i) Excavating a trench
   (ii) Laying a sub-base of gravel
   (iii) Laying a concrete pipe
   (iv) Backfilling
   (v) Compacting

Assume that the length of the pipe is 1200m and that the productivity rates for the five activities are 100, 125, 75, 200 and 150 m/day, respectively. Draw the project diagram, using the LSM. Leave a minimum one-day-time buffer.

2. (a) Define: (i) Total float (ii) Free float (iii) Independent float (iv) Critical path (v) Early (15) finish time (vi) Late start time.

(b) A project has the following characteristics: (20)

Activity	1-2	1-3	1-6	2-5	3-4	3-5	4-5	4-6	5-6
Duration (week)	16	20	30	15	15	10	3	16	12

(i) Draw the project network diagram.
(ii) Prepare an activity schedule showing ES, EF, LS, LF and Float.
(iii) What is the critical time for this project? Show the critical path in the diagram.
(iv) Will the critical path change if activity (2-5) takes 20 weeks instead of 15 weeks? If so, what will be the new critical path?

3. (a) What is conceptual design process? Explain market demand and total cost (10) relationship as economic feasibility study of a project.

(b) What are WBS and OBS? Show how they are linked together in a project with an (08) example.

(c) What is project organization? What are the critical issues involved in project (07) organization? Which types of organization best suits building construction project, and why?

(d) What are Eustress and Distress? Briefly discuss about the psychology of a good (10) project manager.

4. (a) Define: (i) Optimistic time (ii) Most likely time (iii) Pessimistic time (iv) Variance (08)

(b) Write down the advantages and shortcomings of PERT. (07)

(c) A small project consisting of eight activities has the following characteristics: (20)
Time-estimates (in weeks)

Activity	Preceding activity	Optimistic	Most likely	Pessimistic
A	-	2	4	12
B	-	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B,C	9	9	9
G	D	3	3.5	7
H	E,F,G	5	5	5

(i) Draw the PERT network for the project.
(ii) Determine the critical path.
(iii) If the project manager wants to be 99% sure that the project is completed within 30 weeks, how many weeks before that date should he start the project work?

Section – B

5. (a) What is construction management? Write down the objectives of construction management. (10)

(b) For construction of a high rise commercial building project in Khulna city of Bangladesh, a single tendered price is given to complete the project and to satisfy the client. Based on the above information, which type of construction contract is appropriate for the project? Write down the main aspect, advantages and disadvantages of the selected contract type. (15)

(c) Describe the contribution of Construction Management (CM) in sustainable building project. (10)

6. (a) Define resource loading and describe the problems associated with resource loading in the construction industry. (15)

(b) Define: (i) Specialist gang (ii) Optimum team size (iii) Target build rate. (09)

(c) Which technique is used in the planning and scheduling of a linear project? Briefly explain about the technique as well. (06)

(d) What is "Attendance" in subcontracting? (05)

7. (a) From the builder's perspective write down the basic structure of construction cost. (07)

(b) List down the steps for a typical tendering. (03)

(c) Concisely explain the reasons for unnecessary costs in a typical construction project. (10)

7. (d) Alpha private limited doing business in Khulna city since 1968 but recently the (15) company did not get any project because of their higher bidding price. The historical data from past 62 bidding presented in **Table1**.Draw a histogram (frequency distribution) and convert it to probability curve. If the company management decided the mark-up value 7.5% for potential bidding, then how much is the probability to get the job?

Table 1:

Competitor's bid(Tk.)	Alpha's estimated cost(Tk.)	Nos. of bid
100000	98039.22	2
5000000	4761905	5
3000000	2790698	7
25000000	22727273	9
78000000	69333333	12
80000000	69565217.39	11
95000000	80851063.83	8
125000000	104166666.70	6
50000000	40000000	2

Note: Use normal graph paper.

8. (a) ABC builder's is one of the well known construction firm in Khulna city. The (05) Managing Director of the firm has decided to submit potential bid with zero profit. Critically explain the rational to submit the bid with zero profit?

(b) Write down the objectives of value engineering (VE). (06)

(c) What are the objectives of cost estimate from client, designers and builder's (12) perspective?

(d) Describe the principle characteristics of a typical subcontracting in the field (12) of construction.

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 3rd Year 1st Term Regular Examination, 2017
BECM 3107
(Construction Contract and Law)

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 construction contract. " A specific clause prevails over a general one while interpreting a contract" - Explain   (08)

   (b) What is construction document? What types of problems may arise with Incomplete co-ordination and incorrect construction documents?   (07)

   (c) What is "Contra Proferentem"? Explain briefly with a suitable case study.   (10)

   (d) Write note on: (10)
   - (i) Latent ambiguity
   - (ii) Patent ambiguity

2. (a) What is constructive change of contract? What are the possible sources of this kind of contract changes?   (10)

   (b) What is cardinal contract change? How the equitable adjustment is performed during contract change?   (10)

   (c) What do you think about the regular site visit and inspection of A/E has any positive effect on project progress? Write down the interpretation of court in this regard.   (15)

3. (a) What is wrongful termination? Explain briefly with a logical case study?   (13)

   (b) Define unilateral termination? What are the possible causes for which owner may terminate the contractor?   (10)

   (c) What is project commissioning? When commissioning is appointed in a project and why? Write down their role and responsibilities to the project.   (12)

4. (a) What is letter of credit (LOC)? How LOC is issued?   (11)

   (b) Distinguish between: (24)
   - (i) Permance Bond Vs. Payment Bond
   - (ii) Surely Bond vs. LOC
   - (iii) General Liability Vs. Wrap-up Liability
   - (iv) Implied Vs. Espress Indemnity Agreement.

Section – B

5 (a) Define the organs of the state. What is common law? What are the sources of common law? (12)

   (b) Write note on: "Legal system of Bangladesh." (13)

   (c) Describe the legal issues in the adoption of Building Information Modeling (BIM) that will ensure that the industry can collaborate without the worry of adverse legal consequences. (10)

6 (a) Explain with diagram the origin of Liquidated Damage (LD) for a typical construction process. (06)

   (b) Briefly describe the situations when "time is set at large" as a defense for LD claim. (08)

   (c) Write short notes on (i) Contemptuous damages (ii) Nominal damages and (iii) Punitive damages. (06)

   (d) Briefly explain the terms (i) Tort of negligence (ii) Causation and (iii) But for test (15)

7 (a) List down the reasons to choose Adjudication rather than Litigation. (05)

   (b) Under which situations the contractor may nevertheless be able to recover additional payment in the absence of "Conditions Precedent"? (08)

   (c) What are the roles and responsibilities of an Arbitrator? (10)

   (d) Define Alternative Dispute Resolutions (ADR) and write down the advantages of ADR in the context of construction industry. (12)

8 (a) Critically explain why "Letter of Intent" is very dangerous for the construction contract? (05)

   (b) What is Letter of Award (LA)? Write down the important terms and conditions that must contain in the Letter of Award. (10)

   (c) Define Agent. Write down the functions of an agent. (07)

   (a) A asked B to purchase some water proofing cement to build a dam from C. Show the contractual relationship among A, B & C with diagram in the context of law of agency. What are the contractual implications if (13)

(i) C know about A (ii) C never know about A

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 3rd Year 1st Term, Regular Examination, 2017
BECM 3115
(Climate and Architectural Design)

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) Identify the areas where you can utilize your learning from the course "Climate   (15)
         and Architectural Design" as a BECM professional.

    (b) Evaluate "Tilt of the Earth's Axis" from the view point of climate variations at   (20)
         global scale.

2. (a) "Passive control in tropical climate is more critical than sub-tropical or polar   (15)
         climate" - do you agree with the statement? Justify your opinion.

    (b) Characterize the pattern of composite or monsoon climate with example.   (20)

3. (a) Differentiate "Site Climate" from "Regional Climate".   (15)

    (b) Draw a monthly and an annual wind frequency graphs and explain how they are   (20)
         usually interpreted.

4. (a) What is micro climate? What do you know about the micro climate factors?   (10)

    (b) What is site climate? Which factors are responsible for site climate?   (15)

    (c) Write short note on: (i) Ocean current (ii) Natural wind breaker   (10)

Section – B

5. (a) Explain "Climate" and "Context" from the point of view of a built form designer.   (10)

    (b) According to Khana "The South facing house is by far the best one, the one   (15)
         facing the East is the second best. The North facing house is a burden, where
         as the west facing one, a curse" - Do you agree with it? Justify your opinion with
         example and sketches.

    (c) Write down the suggestions of vitruvius on climate and Architecture.   (10)

6. (a) What is the difference between Climate and Environment?   (05)

    (b) Explain the essential knowledge for Climate Design.   (10)

    (c) What are the responsibilities of the built form designers? What kind of   (20)
         complexities they have to face in Climate Design?

7. (a) Write short note on: (25)

         I.   The Cosine Law

         II.   Atmospheric Deplection

         III. Stevenson Screen

         IV.   Super Saturated Air

         V.   Corrected Effective Temperature

    (b) What are the tertiary factors constituting the regional climate?   (10)

8. (a) Define "Green Building Movement".   (10)

    (b) Evaluate and compare between the contemporary and traditional building   (25)
         materials from the climatic point of view.

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 3rd Year 1st Term Regular Examination, 2017
CE 3111
(Structural Analysis and Design-I)

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) Draw the influence lines for the vertical reaction at support B, D and G and the reaction moment at support G of the beam shown in figure below. (15)
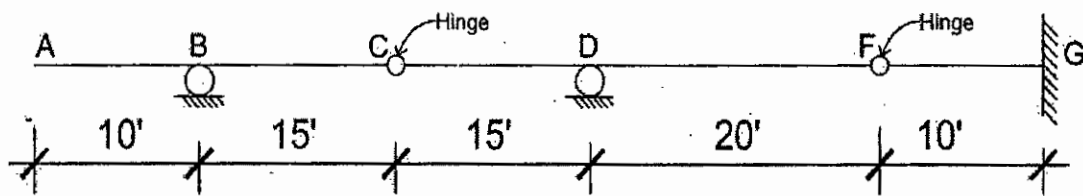
(b) Determine the reactions and draw the shear and bending moment diagrams for the following beam by using the three-moment equation, E = constant. (20)
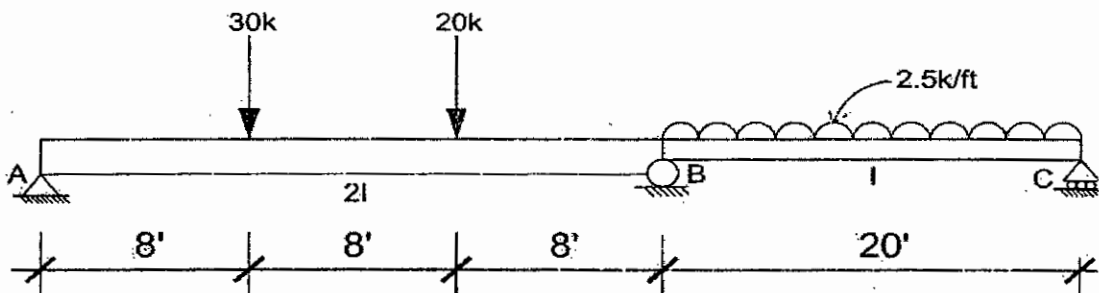
2. (a) Find out the reactions and bar forces of the space truss as shown in figure below. (25)
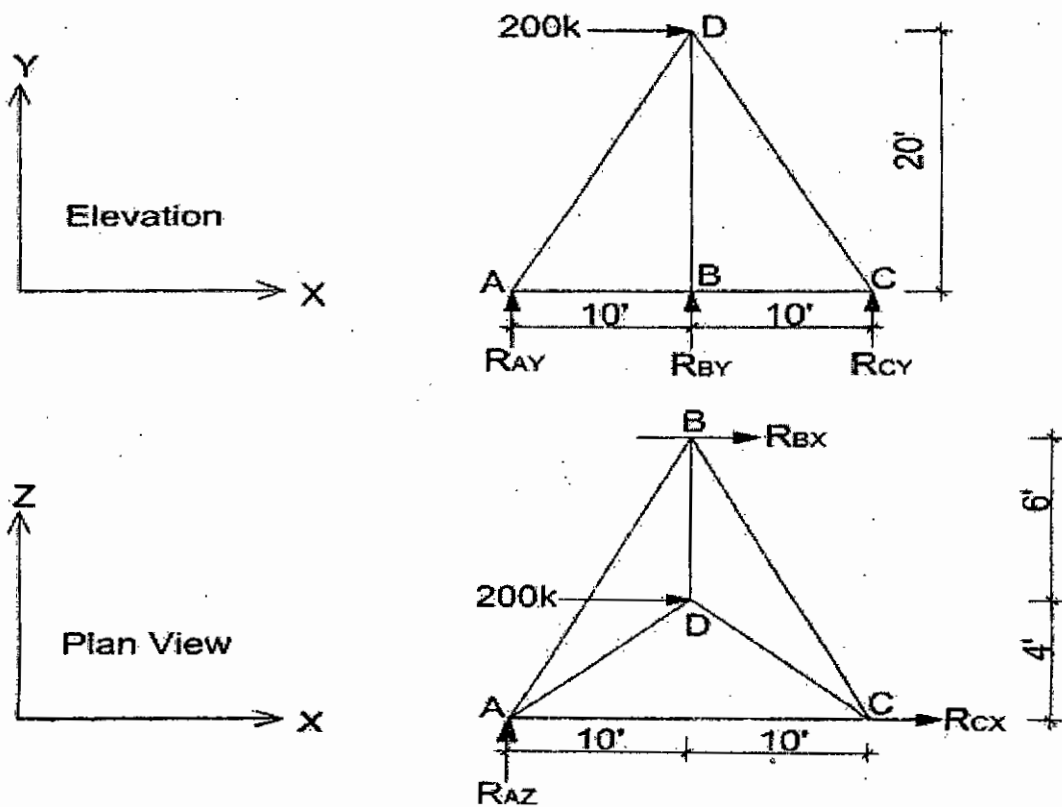
(b) A light suspension bridge is constructed to carry a pathway 3m broad over a (10) channel 24m wide. There are 7 equidistant suspension rods. The central dip of the cable is 1.5m and the platform load is 20kN/m². Find the maximum tension in the cable.

3. (a) Write down the assumptions made in the analysis of building frame subjected to (05) lateral loads by cantilever method.

(b) Analyze the building frame shown below due to lateral loads by cantilever method. (30) Area in parenthesis for each column is also indicated in the figure.
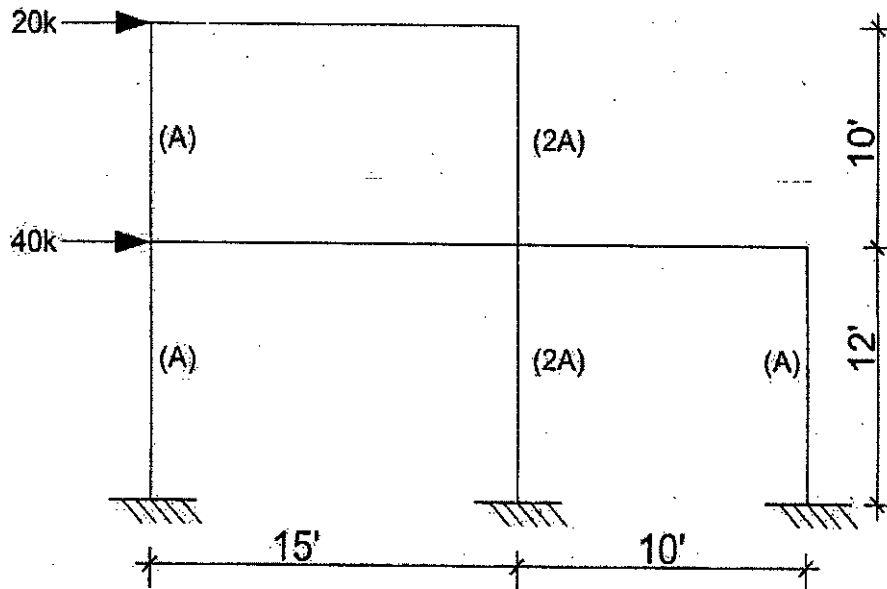
4. (a) Which method is more accurate for the approximate analysis of building frame (05) subjected to lateral loads? Give reasons for your answer.

(b) Analyze the following building frame subjected to lateral loads by factor method. (30)
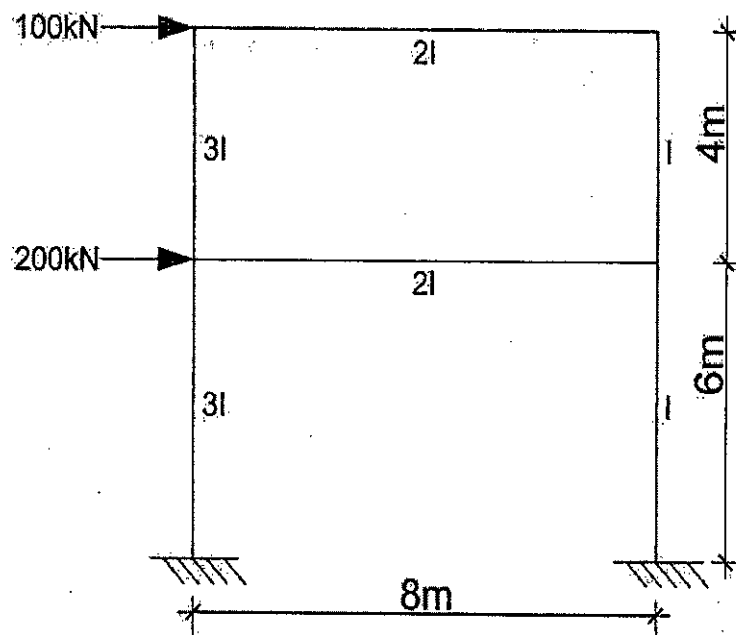
Section – B

5. (a) Calculate the design wind load at each floor level for a five-storied building plan (17) shown in figure and the following data given below:

- Height of each floor = 3.5m
- Structural importance co-efficient = 1.5
- Exposure category = B
- Basic wind = 180 kmph
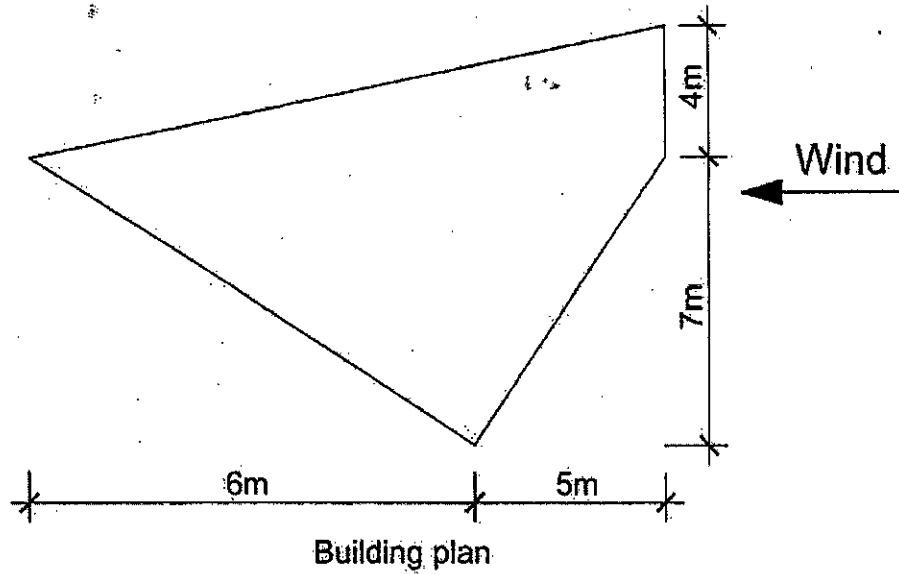- Pressure coefficient = 1.5

Building plan

Table: Gust response factor G_h and G_z and combined height and exposure co-efficient C_z

Height above ground level(m)	G_h and G_z		C_z	
	Exposure B	Exposure C	Exposure B	Exposure C
0-4.5	1.32	1.15	0.80	1.20
6	1.29	1.14	0.87	1.26
9	1.26	1.12	0.97	1.37
12	1.23	1.11	1.06	1.45
15	1.22	1.10	1.13	1.52
18	1.20	1.09	1.19	1.57

(b) Using the Equivalent Static Force Method to calculate the seismic load at each (18) floor of a six-storied hospital reinforced concrete building as shown in figure. Assume the structure is to be an Ordinary Moment Resisting Frame (OMRF) and the data given below:

- Seismic zone co-efficient = 0.15
- Structural importance co-efficient = 1.25
- Response modification co-efficient for OMRF (Concrete)= 5.0
- Site co-efficient for soil characteristics = 1.2
- Seismic dead load = 500 kip/floor

Side Elevation   Building plan
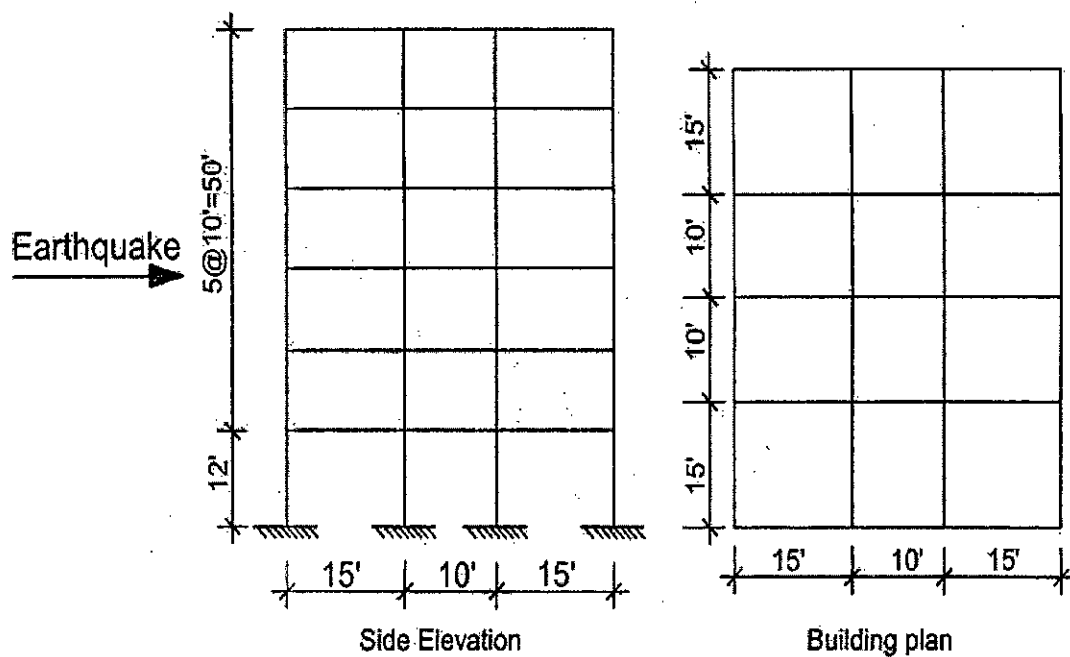
6. (a) Differentiate between (i) determinate and indeterminate, (ii) stable and unstable (07) structures with suitable examples.

(b) Classify the structures shown in the figure below. Check the structures whether (08) stable or unstable and also statically determinate or indeterminate.
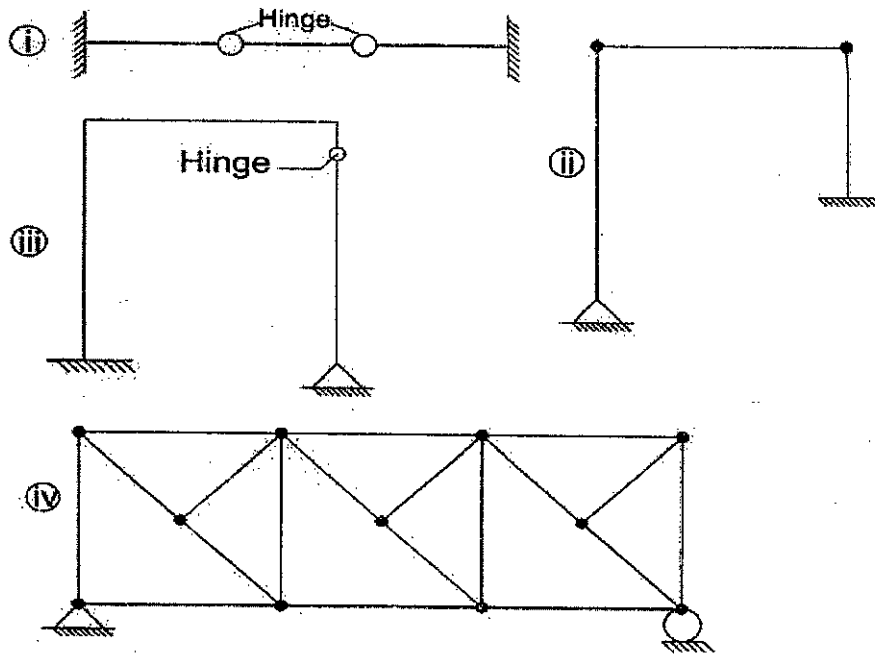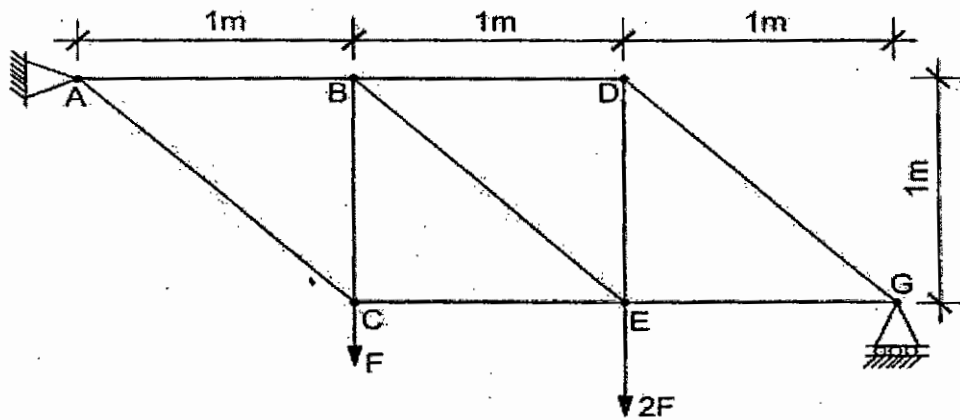

(c) Determine the support reactions, and draw the axial force, shear force and bending (20) moment diagrams for the frame. Joints B and D are rigid joints.
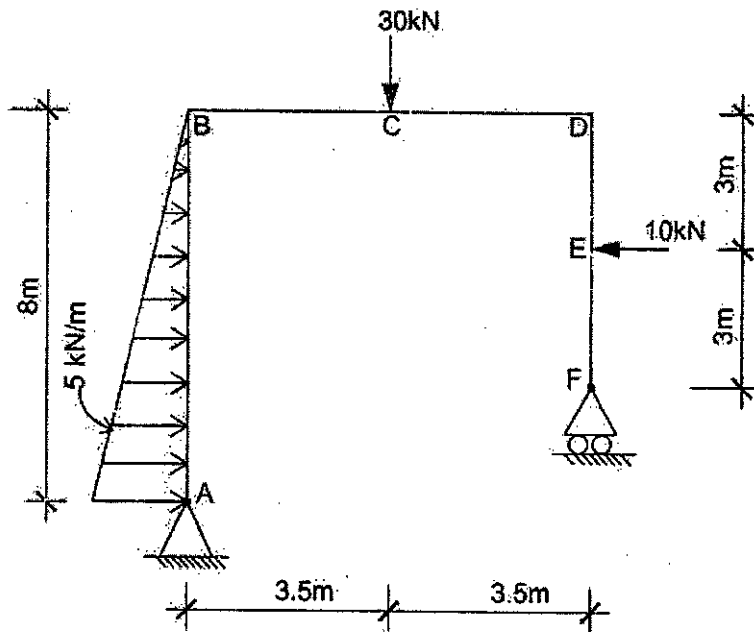

7. (a) Determine the internal forces and moment at the point D in the three hinge (18) parabolic arch as shown in figure.
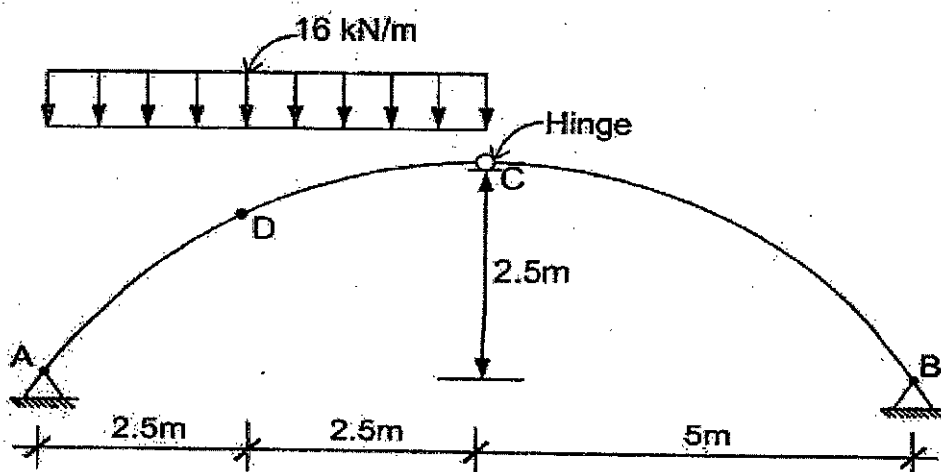
(b) The truss supports load at C and E. If F = 3kN, what are the axial forces in   (17)
     members BC and BE?

8. (a) Define the term conjugate beam. What down the relations between real beam and   (05)
         conjugate beam?

    (b) For the frame shown in the figure below, find out the horizontal deflection at C by   (15)
         the unit load method. Assume, $E = 29 \times 10^3$ Ksi and $I = 600$ in^4 for both members.
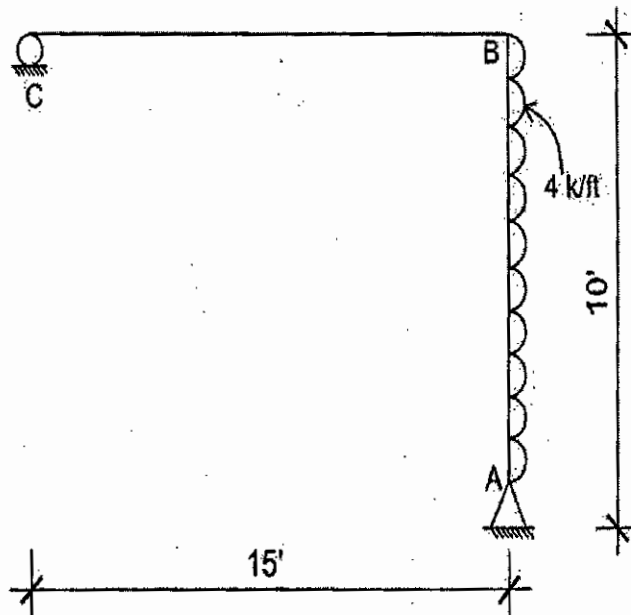
    (c) Using conjugate beam method, find   (15)
         (i)   The deflection of B, C and E
         (ii) The slope at B and D
         Where $E = 30,000$ k/in^2, $I = 200$ in^4.
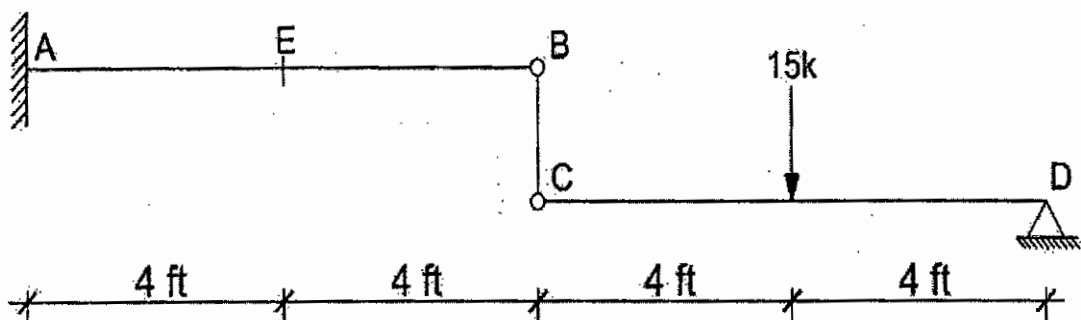
Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 3rd Year 1st Term Regular Examination, 2017
CE 3113
(Reinforced Concrete Structures-I)

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 under reinforced, over reinforced and balanced design? (10)
   What type of design is preferable and why?

   (b) A rectangular beam that must carry a service live load of 2.3 kips/ft and a (25)
   calculated dead load of 1.10 kips/ft on an 20 ft simple span is limited in cross
   section for architectural reasons to 10 inch width and 25 inch total depth. It is
   reinforced for compression bars in one row, the center of which is 2.5 inch from
   upper surface of the beam, and for tension with bars in two rows, the center of the
   lowers row being 2.5 inch above the lower surface of the beam. If f_y = 65,000 psi
   and f'_c = 3500 psi, what steel areas must be provided? Design the beam by USD
   method and show reinforcement details.

2. (a) A rectangular beam must carry a uniformly distributed live load of 750 plf and (15)
   support the dead load of wall weighing 400 plf, in addition to its own weight on a
   simple span 25ft. Design the beam for flexure, using intermediate grade steel at a
   working stress of 20000 psi and concrete at a working stress of 1350 psi. Follow
   WSD method.

   (b) A rectangular beam is limited architectural considerations to a width of 12 inch and (20)
   a total depth of 25 inch. It must resist a total working moment of 2700 kip-inch. If f_s
   = 30,000 psi and f'_c = 4000 psi, What reinforcement is required for flexural design?
   Design the beam by WSD method and show reinforcement details.

3. (a) Distinguish between singly and doubly reinforced beams. (05)

   (b) Explain the fundamental propositions on which the mechanics of reinforced (10)
   concrete is based.

   (c) An isolated T- beam is to be designed to carry a uniformly distributed load on a 25 (20)
   ft simple span. The total ultimate moment at mid-span due to all loads is 7000 kips-
   inch. Find effective width of flange while bw = 12 inch, hf = 3 inch. What tensile
   reinforcement is required at mid-span if f'_c = 3500 psi and f_y = 60,000 psi. Design
   the beam by USD method and show reinforcement details.

4. (a) If additional reinforcing bars are placed only in the compression side of a reinforced (04)
   concrete beam, will they add significantly to the beam's flexural strength? Explain
   your answer shortly.

   (b) An 8-ft-span cantilever beam has a rectangular section and reinforcement as (16)
   shown in figure. The beam carries a dead load, including its own weight, of 1.5 k/ft
   and a live load of 0.9 k/ft. Using f'_c = 4 ksi, and f_y = 60 ksi, check if the beam is
   safe to carry the above loads.

2.5"

3 #7 bars

15.5"

8"

1.5 k/ft DL
0.9 k/ft LL

8'-0"
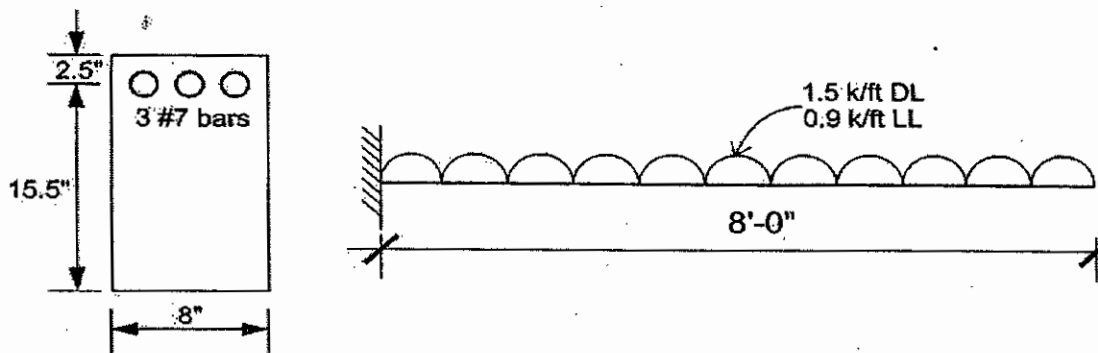
(c) A window is to be centrally located in 250mm thick brick wall and showcase (15) window opening is 2.3m wide. A 700mm wide sunshade is required to be cast monolithic with the lintel. Design the reinforced concrete sunshade. Use f_c = 5 N/mm^2, f_s =140 N/mm^2 and show the reinforcement detailing. Follow WSD method.
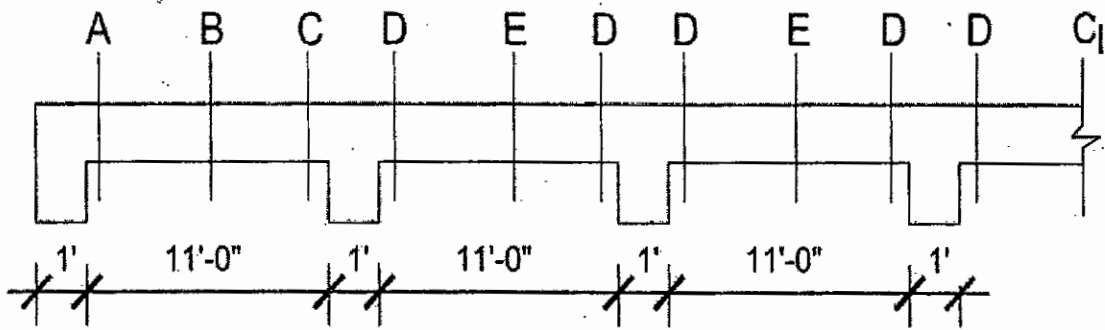
Section – B

5. (a) Why corner reinforcement is provided in slab design? How it is placed? (07)

(b) Design the panel "1" of the two-way slab system shown in figure. The floor consists (28) of six panels in each direction, with a panel size of 24 × 24 ft. All panels are supported on 20 × 20 in. columns, 12 ft long. The slabs are supported by 16" width beams along the column lines. The service live load is to be taken as 100 psf, and the service dead load consists of 22 psf of floor finish in addition to the slab weight. Use normal-weight concrete with f'_c = 3 ksi, f_y = 60 ksi, and USD method. Show the reinforcement detailing of slab in a neat sketch.

Ca (-ve) = Cb (-ve) = 0.05, Ca (+ve) DL = Cb (+ve) DL = 0.027
Ca (+ve) LL = Cb (+ve) LL = 0.032
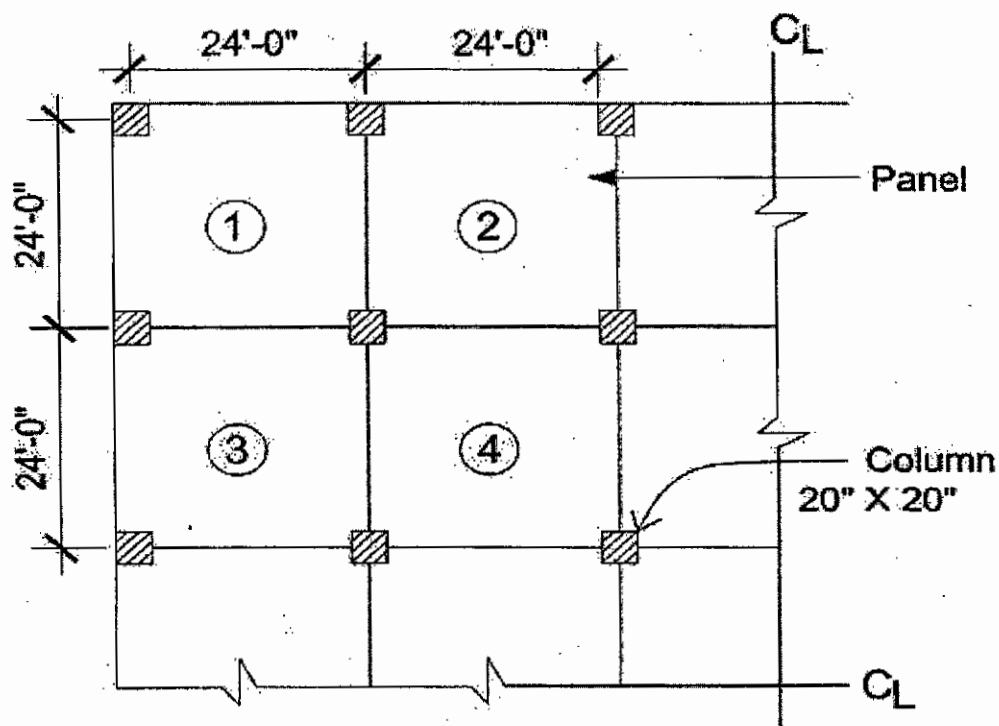
6. (a) Define tangent modulus and secant modulus of concrete from a typical stress- (09) strain curve. What are the influencing factors that affect the shrinkage of concrete?

(b) The cross section of a continuous one-way solid slab in a building is shown in (26) figure. The slabs are supported by beams that effective span 12 ft between simple supports. The dead load on the slabs is that due to self-weight plus 77 psf; the live load is 130 psf. Design the continuous slab by USD method and show the reinforcement detailing. Given: f'_c = 3 ksi and f_y = 40 ksi.

Diagram showing beam with points A B C D E D D E D D C and dimensions 1', 11'-0", 1', 11'-0", 1', 11'-0", 1'

7. (a) The ACI Code provides the following limiting shear values for members subject (06) only to shear and flexure: $2\sqrt{f_c'}$, $4\sqrt{f_c'}$ and $8\sqrt{f_c'}$. What is the significance of each of these limits?

(b) What is web reinforcement? Why it is provided in beam design? (04)

(c) An 18 ft span simply supported beam carries a uniform dead load of 4 k/ft and a (25) live load of 1.5 k/ft. The beam has a width b=12 in. and a depth d=24 in. and is reinforced with six no. 9 bars in two rows. Check the beam for shear and design the necessary shear reinforcement. Given: f_c' = 3 ksi, and f_{yt} = 60 ksi. Use USD method.

8. (a) The #7 bottom bars shown in figure are epoxy coated. Assuming normal-weight (19) concrete, f_y = 60,000 psi, and f_c' = 3500 psi, determine required development lengths:

(i) Using the full ACI Equation with the calculated value of K_{tr}.

(ii) Using ACI Equation with K_{tr} = 0.

Clear spacing between bars is equal to 2.5d_b. Given values are α =1.0, β = 1.5, γ =1.0, λ = 1.0.

#3 stirrup @ 6" in.
#7 bars
21"   24"
3"
3"   3@3"=9"   3"
15"
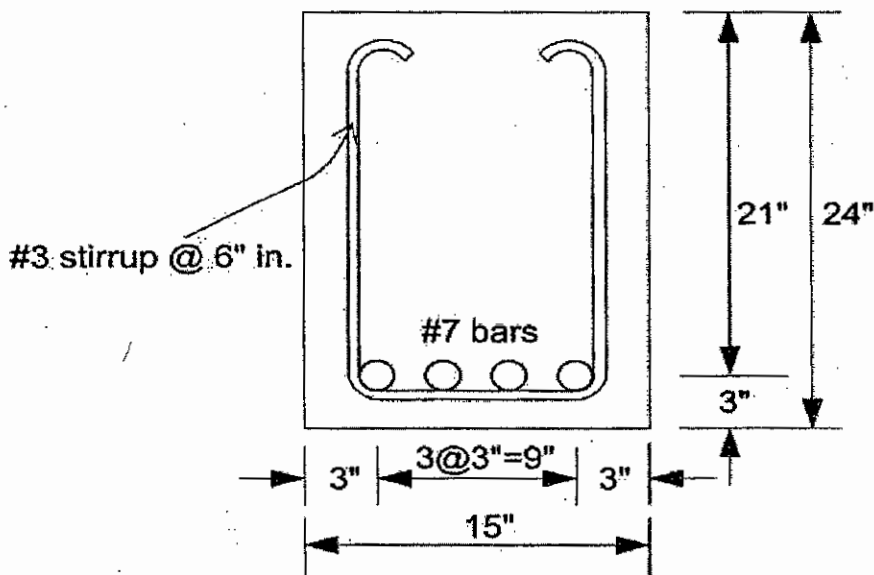
(b) Show dimensional details of hooks used for main reinforcement according to ACI (08) code.

(c) Distinguish between creep and fatigue. Give example. (08)