Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 4th Year 2nd Term Regular Examination, 2018

BECM 4201

(Quality Management in Construction)

Full Marks: 210 Time: 3.0 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 "Quality" and "Quality Engineering". Portrait and explain Feigenbaum's Quality Engineering Triangle. (12)

   (b) What is meant by "Quality Management"? Discuss the process of quality management in construction. (13)

   (c) Distinguish between quality control and quality assurance. Explain quality control system according to Gryna. (10)

2. (a) Draw Feigenbaum's Technological Triangle of total quality control. (13)

   (b) Write note on Shingo's following philosophies (any two): (5X2=10)
   - (i) Just-in-Time Manufacturing Philosophy
   - (ii) Single-Minute Exchange of Die (SMED)
   - (iii) Poka-Yoke System

   (c) Summarize the philosophies developed by Deming and Juran. (12)

3. (a) Write down the principales of Total Quality Management (TQM). What are the stages involved in TQM? (12)

   (b) Outline the changing views of quality from past to present due to the concept of TQM. (11)

   (c) Distinguish between: (12)
   - (i) Black belt and green belt
   - (ii) DMADV and DMAIC tool
   - (iii) TQM and Six Sigma

4. (a) Briefly explain the ISO certification process. Write down the significance of ISO certification. (13)

   (b) What is Integrated Quality Management System (IQMS)? Draw the logic flow diagram for development of IQMS. (13)

   (c) Write notes on: (i) OHSAS (ii) ISO 14000 (iii) ISO 9000 (09)

Section – B

5. (a) Outline a typical quality control process for a RCC slab casting. (07)

   (b) Graphically depict the method of construction project's progress status reporting system. (10)

   (c) Distinguish between quality manual and quality plan with examples. (08)

   (d) Write down the contents of a typical construction progress report. (10)

6. (a) Describe the procedure of remedial works in accordance with clause 28 of Bangladesh Standard Tender document (national). (10)

   (b) What is cost of poor quality? Write down the sources of cost of poor quality. (10)

(c) Write short notes on (i) Quality of design (ii) Quality characteristics and (iii) Quality of conformance.

7. (a) Write short notes on: (i) Quality assessment and (ii) Quality audit (08)

(b) Graphically illustrate the effect of having cost of quality in a typical construction project. (12)

(c) Define facility management. What are the quality standard requirements for facility management project? Describe with example. (15)

8. (a) Describe cost of conformance and cost of non-conformance with at least five examples. (10)

(b) List down at least ten (10) defect that may appear in a typical timber door installation. (10)

(c) Define lippage. Briefly describe a method to check lippage in a floor tiles installation project. (15)

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 4th Year 2nd Term Regular Examination, 2018
BECM 4203
(Information Technology in Construction)

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 Information Technology (IT). Briefly describe the role of IT in construction industry. (10)
   (b) Write down the applications of IT in construction sector for future development. (12)
   (c) How can you correlate information technology and communication technology in one platform? (08)
   (d) What are the limitations present in construction industry in Bangladesh? (05)

2. (a) What are the problems encountered in the traditional construction process comparing with IT? (05)
   (b) How the model driven approach can enhance the overall project life cycle? Explain briefly. (06)
   (c) Briefly describe the construction process modernization through IT with diagram. How many of them are more significant to speed up the construction? (17)
   (d) Concisely describe the main possible ICT development trends for transformation of construction process. (07)

3. (a) What is information system? Briefly describe the available information system those can be used in the construction project. (14)
   (b) How GPS and RFID information systems can work together to explore the construction industry? (05)
   (c) Summarize the intelligent construction project cost estimation methods. (10)
   (d) To predict the cost estimation of a project, how CBR and GA can contribute more when work jointly. (06)

4. (a) Why the design and implementation of network information system is essential for a large construction project? (06)
   (b) Briefly describe the advanced network design for a construction work. (08)
   (c) Describe the system function design of network information design and implementation stage. (11)
   (d) Write short notes on (i) OLAP (ii) Fuzzy logic approach (iii) UWB and (iv) ANN (10)

Section – B

5. (a) What is Building Information Modeling (BIM)? Describe the evolution of BIM in the construction and structural engineering sector. (12)

   (b) Illustrate how BIM technology can be used for construction safety. (13)

   (c) Concisely describe how BIM technology could be used for digital fabrication. (10)

6. (a) In BIM project a data security protocol should be established – Explain the reasoning. (05)

   (b) Describe the geometric and non-geometric attributes of BIM elements. (10)

   (c) Graphically illustrate the application of various BIM 360 products at various phases of construction. (10)

   (d) Demonstrate the power of flow of information in BIM with example. (10)

7. (a) What does BIM 3D, 4D, 5D, 6D and 7D stands for? (05)

   (b) Define sustainable design. Describe how BIM technology aid to achieve sustainable building design. (10)

   (c) Describe the process of BIM based conceptual whole building energy simulation. (10)

   (d) Write short notes on (i) Parametric modeling (ii) Interoperability (iii) IFC and (iv) BIM based collaboration (10)

8. (a) Briefly describe the attributes and properties of BIM models. (10)

   (b) Demonstrate how drone and photogrammetric can be used for construction safety inspection. (10)

   (c) Define level of details (LOD) and describe the features of LOD 100, 200, 300, 400 and 500. (15)

Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 4th Year 2nd Term Regular Examination, 2018

BECM 4205

(Real Estate Development)

Full Marks: 210 Time: 3 hrs

N.B. i) Answer any three questions from each section in separate scripts.

ii) Figures in the right margin indicate full marks.

Section – A

1. (a) Elaborate the technical and literal meaning of real estate with an example. (10)

   (b) Briefly distinguish among real estate, real property and personal property with appropriate example. (10)

   (c) Explain the role of vendor, agent and end user in real estate business of Bangladesh perspective. (15)

2. (a) Define the concept of employee communication in real estate profession. (10)

   (b) Discuss each element of communication process among employees in real estate with figure. (15)

   (c) Evaluate the effective employee communication and basic types of communication styles at the corporate level. (10)

3. (a) How do you use the management tools in managing a new housing development project in Bangladesh? (15)

   (b) For the internal facilities in a housing project which type of management tools you may apply? (10)

   (c) What categories of management tools you may apply for the external facilities in the housing complex? (10)

4. (a) Briefly explain the environmental facilities in real estate. (15)

   (b) Discuss the elements of health & safety facilities and the maintenance policy of these facilities. (10)

   (c) Explain the elements of entertainment facilities and briefly discuss the maintenance of these facilities policy with figure. (10)

Section – B

5. (a) Is real estate a property? (05)

   (b) "Real estate includes not only the land surface of the earth but also the permanent improvements above and below the surface" – why? (15)

   (c) Real estate market tends to be highly segmented and localized – why? (15)

6. (a) True real estate decisions are about acquiring financing, using, improving and disposing of actual real estate assets. Discuss the statement. (15)

   (b) Explain the four combinations of real estate investment risk with examples. (20)

7. (a) Show the relationship among property market with financial and economic framework. (10)

(b) Market research approach focuses from broad to specific. Explain with example. (10)

(c) When will the downturn actually occur in a real estate market? Explain with supply and demand curve. How developer will survive during a market downturn? (15)

8. (a) What is the valuation of real estate? Summarize the primary principles of real estate valuation with example. (15)

(b) If you are to estimate a land price in Fulbarigate (beside the main road). List the major factors that would affect the land price. Justify the factors according to the socio economic context of Khulna and express the price function through hedonic assumptions. (20)

Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 4th Year 2nd Term Regular Examination, 2018

CE 4221

(Design of Steel Structure)

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.
iii) Necessary tables & graphs will be supplied.

Section – A

1. (a) Briefly describe the ductility and fatigue strength of structural steel. What are the possible failure modes of steel structure? (10)

   (b) Why steel structures are more advantageous than RC structures? What are the applications of steel structures? (10)

   (c) Compare and contrast built-up and hot rolled section in steel structures. (07)

   (d) What are the major problem encountered for steel structures and how it can be prevented? (08)

2. (a) Display the nonlinear stress-strain response of structural steel and indicate the following from the graph: (i) Elastic limit (ii) Proof stress (iii) Elastic modulus and (iv) Strain hardening. (05)

   (b) Select the lightest available W sections and state the LRFD design strength, and the ASD allowable strength for the column that is described as follows: P_D = 250 k, P_L = 125 k, L = 18.5 ft, pinned end supports W14, F_y = 50 ksi (Use AISC tables). (16)

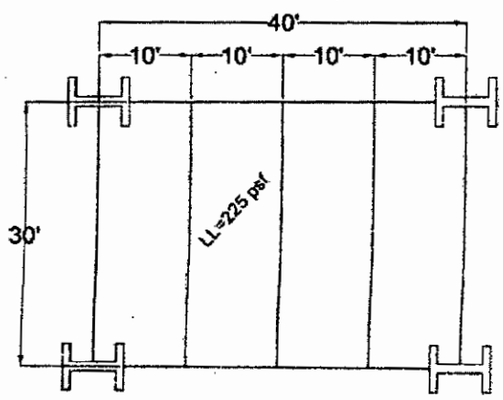
   (c) A column base plate is to be designed for a W12x152 section (F_y = 50 ksi) that supports the loads P_D = 200 k and P_L = 450 k. Select an A 36 plate (F_y = 36 ksi) to cover the entire area of the 3 ksi concrete pedestal underneath. (14)

3. (a) What is a magnification factor for a beam-column connection? State the limitations of Euler's formula in column. (05)

   (b) A 14-ft W14x120 (50 ksi steel) is used as a beam-column in a braced frame. It is bent in single curvature with equal and opposite moments. Its ends are rotationally restrained, and it is not subjected to intermediate transverse loads. Is the section satisfactory if P_D = 70 k, and P_L = 100 k and if it has the first order moments M_{DX} = 60 ft-k, M_{Lx} = 80ft-k, M_{Dy} = 40 ft-k and M_{Ly} = 60 ft-k? (30)

4. (a) Why shear connectors are used in steel concrete composite slab and beam? (05)

   (b) Design an interior composite beam for the floor whose plan shown in below figure. Assuming the beam is to be constructed without temporary shoring. Use 50 ksi steel, f'c = 4 ksi (n = 8), a 3.5" slab, and use LRFD method. (30)



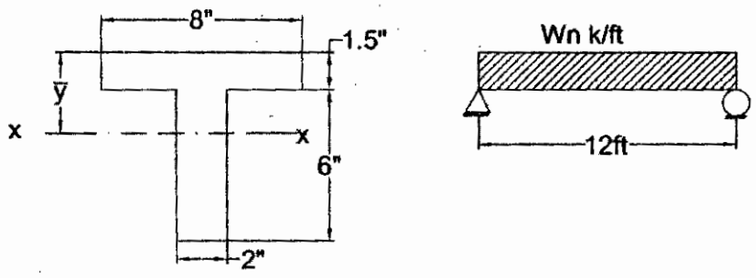
Section – B

5. (a) Briefly describe the failure of a riveted joint (15)

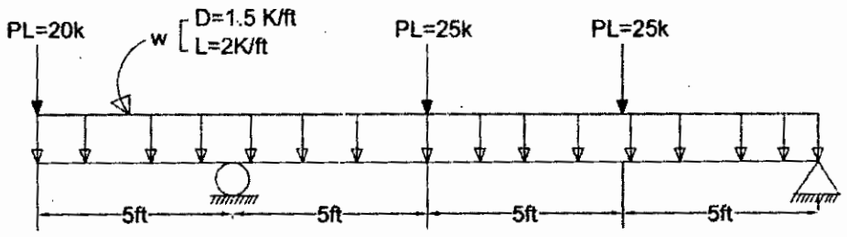
(b) In a truss girder of a bridge, a diagonal consists of a 16 mm thick flat and carries a pull of 750 kN and is connected to a gusset plate by a double cover butt joint. The thickness of each cover plate is 10 mm. Determine the member of rivets necessary and the width of the flat required. What is the efficiency of the joint? Sketch the joint. Take working stress in shear in rivet = 100 N/mm^2, working stress in bearing in rivet = 300 N/mm^2 and working stress in tension in plate = 0.6 x 260 N/mm^2. (15)

(c) What are the assumptions for design of riveted joint? (05)

6. (a) Determine M_y, M_n and Z for the steel Tee beam shown in below figure. Also, calculate the shape factor and the nominal load (w_n) that can be placed on the beam for a 12 ft simple span. Take F_y = 50 ksi. (15)



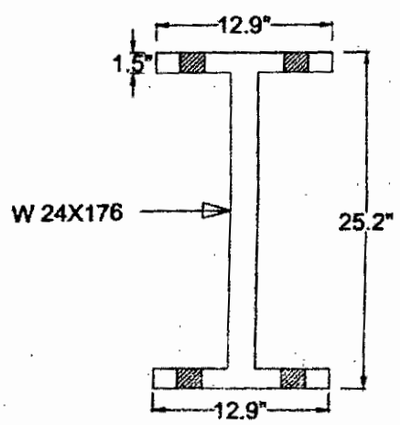
(b) Using both LRFD and ASD, select the most economical sections with F_y = 60 ksi, unless otherwise specified, and assuming full lateral bracing for the compression flanges as shown in below figure. Working or service loads are given for each case, and beam weight is not included. (20)



7. (a) Determine the ϕM_n and M_n/Ω_b for the W24x176 (Fy = 55 ksi and Fu = 60 ksi) beam shown in figure for the following situations: (15)

(i) Using AISC specification and assuming two lines of 1-in bolts in standard hole in each flange.

(ii) Using the AISC specification and assuming four lines of 1-in bolts in standard hole in each flange.

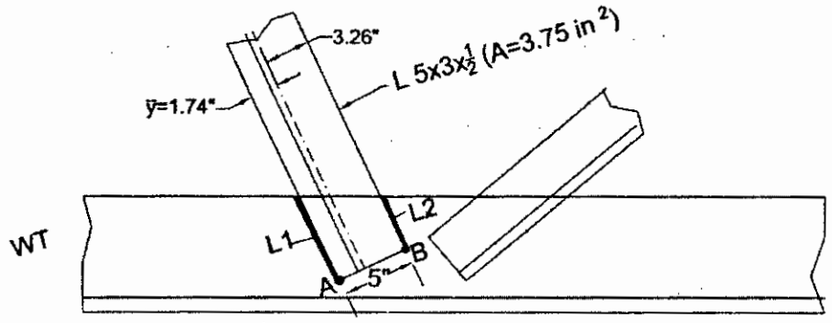


(b) Design a 10 ft single angel tension member to support a dead tensile working load of 30 k and live tensile working load of 40 k. The member is to be connected to one leg only with 7/8 -in bolt (at least four in a line 3 in a on center). Assume that only one bolt is to be located at any one cross section. Use A 36 steel with Fy = 40 Ksi and Fu = 60 Ksi. (20)

8. (a) Briefly describe the types of welding. (08)

(b) What are the advantages of welding? (09)

(c) Use F_y = 50 ksi and F_u = 65 ksi, E70 electrode, and the SMAW process to design side fillet welds for the full capacity of the 5 x 3 x 1/2-in angle tension member shown in figure below. Assume that the member is subjected to repeated stress variations making any connection eccentricity undesirable. Check block shear strength of the member. Assume that WT chord member has adequate strength to develop the weld strength and that the thickness of its web is 1/2 inch. Assume that U = 0.87. (18)



Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 4th Year 2nd Term Regular Examination, 2018

CE 4223

(Precast and Prestressed Concrete)

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.
iii) Assume reasonable value for any missing data

Section – A

1. (a) What are the mechanisms separated prestressing members than the reinforced concrete members? What are the uses of prestressing in structural engineering? (10)

   (b) Compare and contrast post-tensioning and pre-tensioning methods of prestressing. (15)

   (c) Distinguish between external and internal prestressing with suitable examples. (10)

2. (a) What is brusting force? Briefly describe the stress distribution of end block, distance along the axis of girder in post-tensioned prestressing. (06)

   (b) Differentiate between strands and tendons in prestressing system. (05)

   (c) Shortly describe the grouting principles. Compare full, partial and limited prestressing methods. (07)

   (d) The beam end shown below has six anchorages with 90 mm X 90 mm bearing plates and a jaking force of 550 KN applied to end anchorages. Determine the reinforcement required to contain the brusting forces of f_y = 460 N/mm^2. (17)

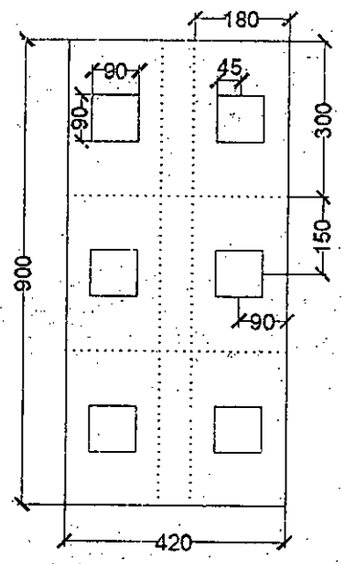


Table: Design brusting tensile forces in end block.

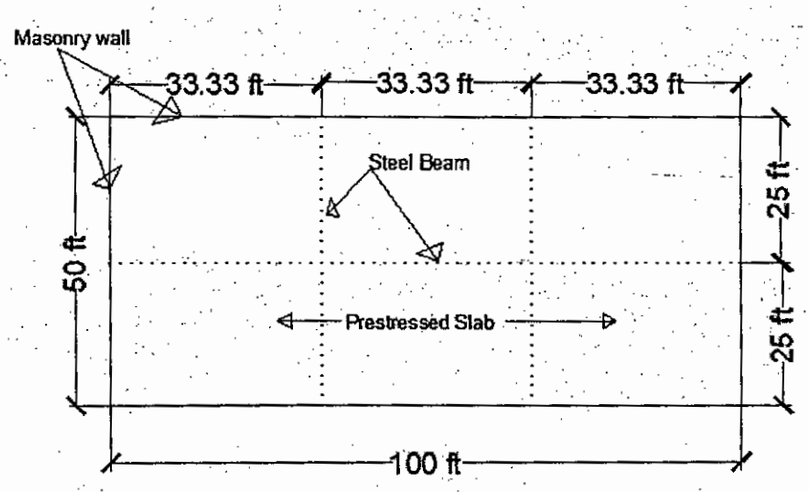
Y_{Po}/Y_0	0.2	0.3	0.4	0.5	0.6	0.7
F_{bst}/P_o	0.23	0.23	0.20	0.17	0.14	0.11

3. (a) Shortly describe the linear and circular prestressing with appropriate examples. (06)

   (b) A two-way prestressed concrete slab, measuring 50 X 100 ft overall, is to be provided to carry a multi-purpose hall. Support will be provided by masonry walls on the perimeter, and steel framing along the interior column lines, as shown in figure. An asphalt surface 1.5-in. thick, weighing 19 psf, will be provided. (a) Design the right corner slab for a balanced load consisting of the self-weight of the slab (29)

and the asphalt topping. Also determine the required slab thickness, prestressing force and number and spacing of ½-in. diameter Grade 270 unbonded post-tensioning tendons. Concrete strengths f'_{ci} = 3500 psi, f'_c = 5,000 psi and Ec = 3.6 x10^6 psi (b) Concrete flexural stresses in the fully loaded stage assuming live load of 120 psf.

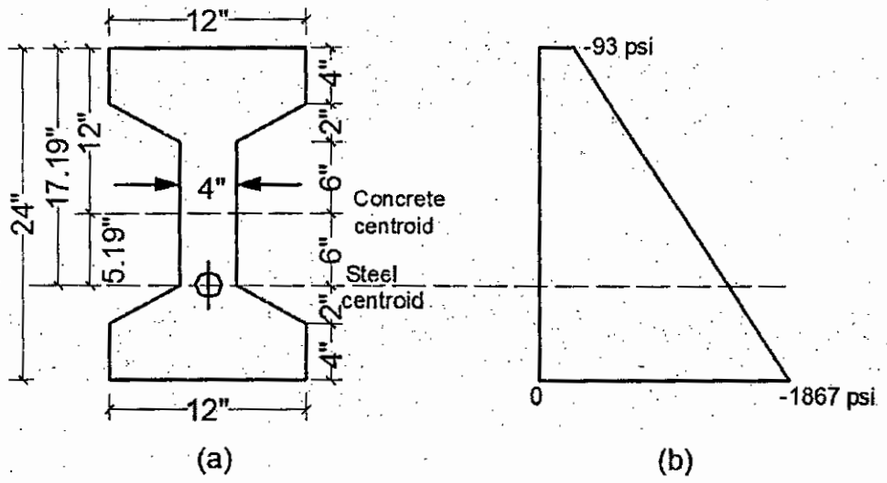
Ca(-ve) = 0.076, Cb(-ve) = 0.024, Ca,DL (+ve) = 0.043, Cb,DL(+ve) = 0.013, Ca,LL(+ve) = 0.052, Cb,LL(+ve) = 0.016



4. Calculate the center deflection of the 50-ft span I-beam shown in figure at age 0, 30, 180, and 360 days, using step by step method. The member, originally studied in connection with elastic stress analysis, is to carry its own weight of 195 plf and will be subjected to a service live load of 590 plf. The following data are given: (35)

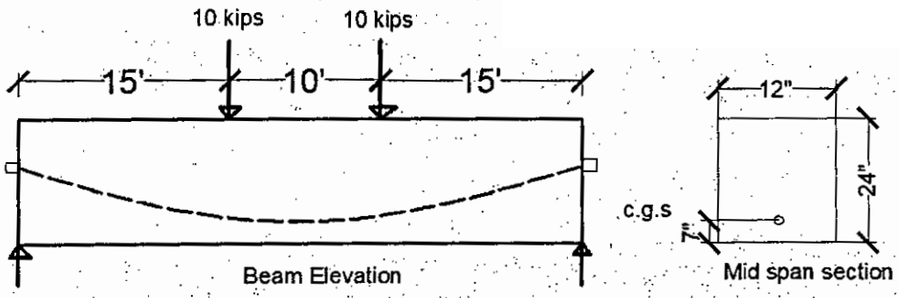
P_i = 169,000 lb, A_p = 0.96 in^2, f_y = 210,000 psi, f_{pi} = 175,000 psi, A_c = 176 in.^{2}, I_c = 12,000 in.^{4}, r^2 = 68.2 in.^{2}, E_c = 4,030,000 psi, C_u = 2.4, $\varepsilon_{sh,u}$ = 800x10^{-6}

The member will be constructed of normal density concrete, moist-cured, and will be prestressed at age seven days. E_c will be taken as constant.

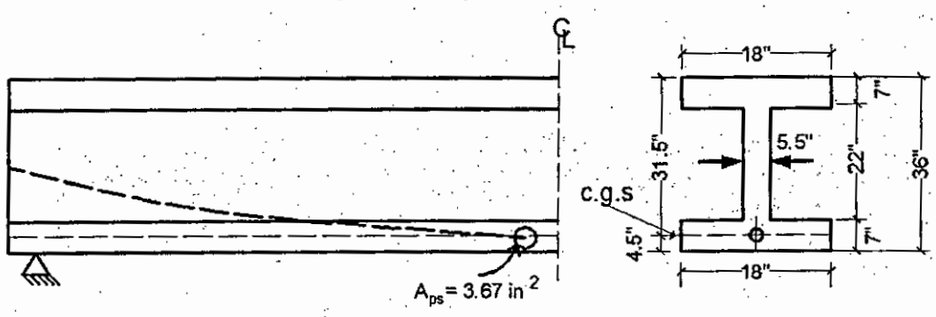


Section – B

5. (a) A post-tensioned bonded concrete beam, shown in figure below, has a prestress of 350 kips in the steel immediately after prestressing which eventually reduces to 300 kips due to losses. The beam carries two live loads of 10 kips each in addition to its own weight of 300 plf. Compute the extreme fiber stresses at midspan (a)Under the initial condition with full prestress and no live load and (b) Under the final condition after the losses have taken place and with full live load. (12)



(b) An I-shaped beam is prestressed with A_{ps} = 3.67 in^2 as prestressing steel with an effective stress, f_{se} of 160 ksi. The c.g.s of the strands is 4.5 in above the bottom of the beam as shown in figure below along with the shape of the cross section. Material properties are: f_{pu} = 270 ksi, f'_c = 7000 psi. Find the ultimate resisting moment of the section for design following the ACI code. (23)

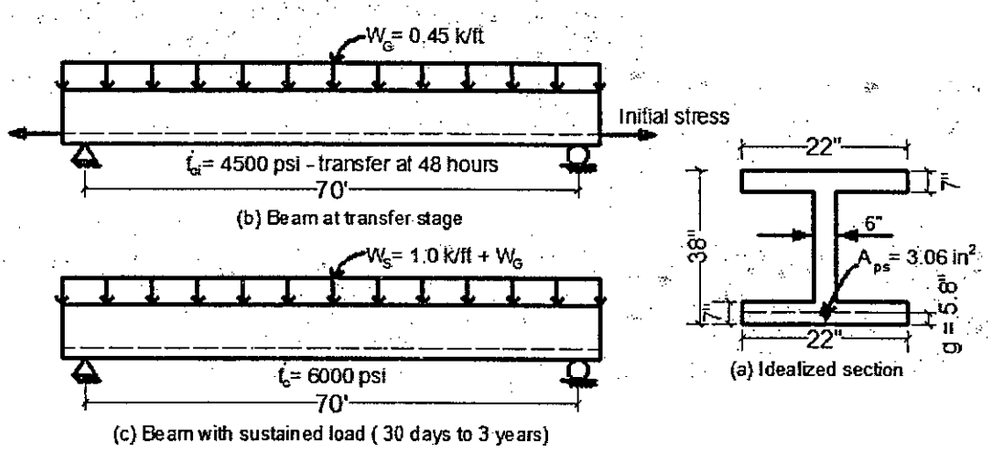


6. (a) Make a preliminary design for the beam section to resist a total moment of 320 k-ft of which M_G = 40 k-ft, h = 36 in. Assume f_c = 1600 psi, f_{se} = 125000 psi. (15)

(b) Make the final design from the initial section obtained above. Given, f_b = -1.80 ksi, f_0 = 150 ksi, f_t = -1.60 ksi. (20)

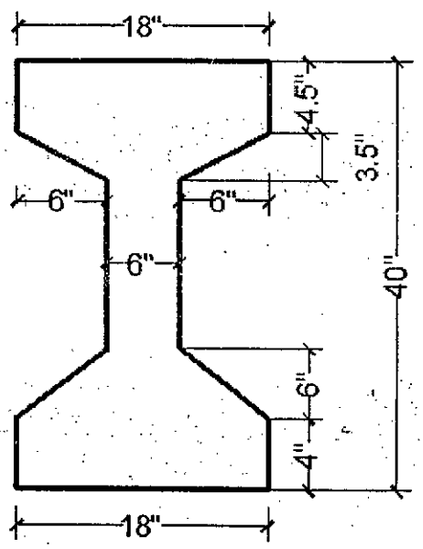
7. (a) Write short notes on the following terms which are related with loss of prestressing: (i) Elastic shortening (ii) Anchorage slip (iii) Creep of concrete (iV) Shrinkage of concrete and (V) Relaxation of concrete. (10)

(b) Estimate the change of prestress force with time for the pretensioned-prestressed concrete beam shown in figure. The normal weight concrete beam has only its own weight W_G = 0.45 k/ft acting at transfer of prestress which occurs approximately 48 hours after initially stressing the tendons to 202.5 ksi in the prestressing bed. For 30 days it will assume the beam carries only W_G = 0.45 k/ft on a simply supported 70 ft span. Additional superimposed load W_S = 1.0 k/ft is added to the beam when erected at 30 days and is sustained for three years or more on the simple beam spanning 70 ft. Assume the following material properties: f'_{ci} = 4500 psi, f'_c = 6000 psi, normal weight concrete (Type III cement, steam-cured concrete, 75% relative humidity), stress-relieved ½ in. diameter strands with f_{pu} = 270 ksi, A_{ps} = 3.06 in^2, J = 0.15, K_{re} = 20 ksi, C = 1.45, V/S = 3. Estimate total losses due to prestressing by using ACI-ASCE committee method. (25)



8. (a) Derive the equation, $F_2 = F_1 e^{-\mu\alpha - KL}$ for the frictional losses, where the symbols bear their usual meaning. (12)

(b) Determine the limiting envelope for tendon of simply supported pretensioned I-beam for a parking garage with draped in a parabolic shape of span 65 ft. The beam has to carry a superimposed sustained service live load of 1100 plf and superimposed dead load of 100 plf. Assume the beam is made of normal weight concrete with f'_c = 6000 psi and that the concrete strength f'_{ci} at transfer is 75% of the cylinder strength. Assume also that the time dependent losses of the initial prestress are 18 percent of the initial prestress and that f_{pu} = 270000 psi for stress-relieved tendons of area 2.907 in^2, e_c = 13 in and e_e = 6 in. Consider the mid-span, quarter-span and beam ends as the controlling sections. Also determine the limiting envelope for tendon location such that the limiting concrete fiber stresses are at time exceeded. (23)



For this figure, Ic = 70688 in^4, r^2 = 187.5 in^2, A_c = 377 in^2, C_t = 21.16 in, S^t = 3340 in^3, C_b = 18.84 in, S_b = 3750 in^3, W_b = 393 plf