USN | | | | | | | | | | |

10CV81

Eighth Semester B.E. Degree Examination, June/July 2018
Advanced Concrete Technology

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing daya may be suitably assumed.
3. Use of IS:10262-2009 and IS456-2000 are permitted.

PART – A

1 a. Enumerate the importance of Bogue's compounds in ordinary portland cement. **(07 Marks)**
b. Explain the rheology of concrete in terms of Bingham's parameter. **(07 Marks)**
c. Determine capillary porosity, total porosity and gel space ratio for a cement paste with W/C ratio 0.5 and degree of hydrogen 90% **(06 Marks)**

2 a. Explain the mechanism of 'deflocculation' of cement particles by super plasticizers with neat sketches. **(10 Marks)**
b. Explain the Marsh cone test for optimum dosage of superplasticizer. **(05 Marks)**
c. Explain the effect of Flyash on hardened concrete. **(05 Marks)**

3 a. Explain the factors affecting the mix design of concrete. **(06 Marks)**
b. Design a concrete mix of M_{20} grade for the following data [M_{20} grade].
Maximum size of aggregate = 20 mm
Workability = 100 mm [Slurry]
Degree of quality control = good
Type of exposure = mild
Specific gravity of cement = 3.15.
Specific gravity of coarse aggregate = 2.65
Specific gravity of fine aggregate = 2.60
Water absorption of coarse aggregate = 0.5%
Water absorption of fine aggregate = 1.0%
Free surface moisture coarse aggregate = Nil
Free surface moisture fine aggregate = 2.0%
Coarse aggregate percentage of different fractions 60% : 40%
Fine aggregate belongs to Zone II. **(14 Marks)**

4 a. Explain the influence of W/C ratio and age on permeability of concrete. **(07 Marks)**
b. Discuss in brief alkali aggregate reaction. What precautions are necessary to minimize? **(07 Marks)**
c. What is sulphate attack? Explain briefly the methods of controlling sulphate attack. **(06 Marks)**

PART – B

5 a. What is RMC? Explain briefly advantages of RMC. **(06 Marks)**
b. Explain shot crete and under water concreting. **(06 Marks)**
c. What are the advantages of self compacting concrete? What are different test methods for determining the rheology of self compacting concrete? **(08 Marks)**

6 a. What are the different types of fibres used in concrete? **(06 Marks)**

b. What are the factors effecting properties of fibre reinforced concrete. **(08 Marks)**

c. What is ferro-cement? List the various applications of Ferro cement. **(06 Marks)**

7 a. Write short notes on :

(i) Light weight concrete

(ii) High density concrete **(06 Marks)**

b. What is 'High performance concrete [HPC]'? What are the applications of high performance concrete? **(06 Marks)**

c. Discuss in brief the properties of High performance concrete in fresh and hardened state. **(08 Marks)**

8 Explain the following :

a. Tests on hardened concrete **(08 Marks)**

b. Rebound Hammer Test (NDT) **(06 Marks)**

c. Pulse Velocity Test (NDT) **(06 Marks)**

* * * * *

USN | | | | | | | | | | |

10CV82

Eighth Semester B.E. Degree Examination, June/July 2018
Design and Drawing of Steel Structures

Time: 4 hrs. Max. Marks:100

Note: *1. Answer any ONE full question from each part.*
2. Use of IS-800-2007 and Steel table are permitted.

PART – A

1 a. A secondary beam ISMB 300@44.2 kg/m is to be connected to the main beam ISMB 400@61.6 kg/m, two angles ISA 100 × 100 × 6 mm are used to connect the webs of beams. Three bolts of 20 mm diameter are used to connect angles to web of secondary beam. Six bolts of 20 mm diameter are used to connect to angles to the web of main beam. The top flanges of both beams are at the same level.
Draw to a suitable scale
(i) Sectional elevation
(ii) Side view showing all details. **(15 Marks)**

b. An un-stiffened seated connection for beam ISLB 500@75 kg/m to the flange of a column ISHB 400@82.2 kg/m is done using 2 rows of 2-16mm diameter bolts with an angle ISA 110×110×10 mm. Top cleat angle is ISA 100×100×8 mm with 2-16 mm diameter bolts on each leg. Draw to suitable scale
(i) Front view
(ii) Side view. **(15 Marks)**

2 a. An upper storey column ISHB 300@ 577 N/m is to be spliced with a lower storey column ISHB 400@ 758.5 N/m. The two columns are coaxial. Provide 50 mm thick bearing plate and 6 mm thick flange splice plate. Use 10 bolts of 20 mm diameter on each side of the joint in two lines of 5 bolts each for connecting flanges of the columns to flange splice plate.
Draw to a suitable case
(i) Sectional elevation
(ii) Side view with details. **(15 Marks)**

b. Draw to a suitable scale sectional plan, front elevation and side view of a column with slab base using following data :
Column → ISHB 350 @ 710.2 N/m
Base plate → 650mm × 500mm × 35mm
Cleat angle → ISA 130 × 130 × 8 mm of length 500 mm
Concrete pedestal → 1.20m × 1.00m × 0.70m
Anchor bolts → 4 – 16 mm diameter
4 – 20 mm diameter bolts on each side of flange to connect cleat angles to the column and same number of counter sunk bolts to connect angles to the base plate.
Web cleat angle → ISA 75 × 75 × 8 mm with 4mm weld all around. **(15 Marks)**

PART – B

3 Design a simply supported gantry girder to support an electrically operated crane, for the following data:

i) Span of crane girder = 25 m
ii) Span of gantry girder = 8 m
iii) Capacity of crane = 200 kN
iv) Self weight of crane = 150 kN [Excluding crab]
v) Weight of crab = 75 kN
vi) Wheel base distance = 3.5 m
vii) Minimum hook approach = 1.00 m
viii) Self weight of rail = 0.30 kN/m
ix) Height of rail = 75 mm **(40 Marks)**

Draw to suitable scale

a. The c/s of gantry girder and its attachment to supporting column of the bracket
b. Plan details
c. Side elevation **(30 Marks)**

4 The centre line of a roof truss is as shown in the Fig.Q4. The magnitude and nature of forces under service conditions are

Top chord members → 120 kN compression
Bottom tie members → 100 kN Tension
Interior members → 60 kN Tension and 50 kN compression.

For all the interior members use similar single angle section. Design the members using 16 mm diameter of grade 4.6. Also design a bearing plate and anchor bolts, four in numbers for pull of 60 kN to connect the truss to an RCC column 300 × 300mm of M20 grade concrete. **(40 Marks)**

Draw to a suitable scale:

(i) Elevation of truss greater than half space (ii) Elevation of joint 'C' (iii) Elevation of support 'A'. **(30 Marks)**

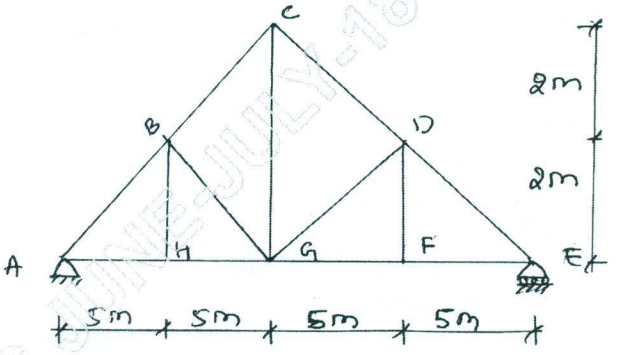


Fig.Q4

* * * * *

USN | | | | | | | | | | |

10CV833

Eighth Semester B.E. Degree Examination, June/July 2018
Pavement Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What are the different layers of flexible pavements? Explain the functions of each. **(08 Marks)**

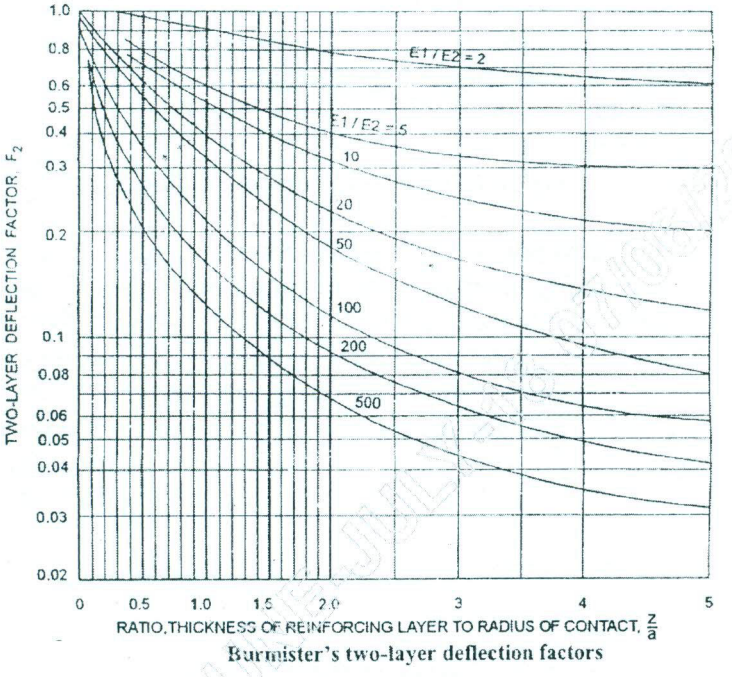
b. Bring out the points of difference between highway and airfield pavements. **(06 Marks)**

c. List the various factors to be considered for the selection of type of pavement. Also list the factors affecting pavement performance. **(06 Marks)**

2 a. Explain Frost action. What are the measures adopted to reduce it's effects. **(06 Marks)**

b. State the assumptions and limitations of Elastic Single layer theory and Burmister's two layer theory. **(06 Marks)**

c. The plate bearing tests were conducted with 30 cm plate diameter on soil subgrade and over 45 cm base course. The pressure yielded at 0.5 cm deflection are 1.25 kg/cm^2 and 8 kg/cm^2 respectively. Design the pavement section for 5100 kg wheel load with tyre pressure of 7 kg/cm^2 for an allowable deflection of 0.5 cm using Burmister's approach. (Refer chart given for Burmister's two layer deflection factors in Fig. Q2 (c)) **(08 Marks)**



Burmister's two-layer deflection factors

Fig. Q2 (c)

3 a. Calculate the ESWL of a dual wheel assembly carrying 2044 kg each for pavement thickness of 15 cm, 20 cm and 25 cm. Centre to centre tyre spacing is 27 cm and distance between the walls of the tyre is 11 cms (Use Graphical Method). **(10 Marks)**

b. Calculate the design repetitions for 20 year period for various wheel loads equivalent to 22.68 kN wheel load using the following data on a four lane road. **(10 Marks)**

Load in KN	22.68	27.22	31.75	40.82	45.36	49.90	54.43
Volume per day	30	25	20	15	10	5	1
EWLF	1	2	4	8	16	32	64

4 a. Design the pavement section by triaxial-Kansas method using the following data:
Wheel load – 41 KN
E value of base course = 40 N/mm^2
E value of subgrade soil = 10 N/mm^2
E value of wearing course = 100 N/mm^2
Radius of contact area = 150 mm
Design deflection = 2.5 mm
Sketch the pavement section. **(10 Marks)**

b. Briefly explain the procedure of CSA method for the flexible pavement, design as per IRC-37-2001. **(10 Marks)**

PART – B

5 a. Define modulus of subgrade reaction and radius of relative stiffness. **(06 Marks)**

b. Write the commonly used equations for the theoretical computation of wheel load stress by Westergaard's analysis of Interior; Edge and corner loadings. **(06 Marks)**

c. Calculate the stresses at interior, Edge and corner regions of a cement concrete pavement using Westergaard's stress equation. Use the following data:
Wheel load = 5100 kg ; E = 3×10^5 kg/cm^2 ; μ = 0.15; Pavement thickness = 18 cm
Modulus of subgrade reaction = 6 kg/cm^3; Radius of contact area = 15 cm **(08 Marks)**

6 a. List the various requirements of joints in cement concrete slabs. Explain in detail with sketches: (i) Expansion joints. (ii) Contraction joints. **(10 Marks)**

b. A CC pavement has thickness of 18 cm and has two lanes of 7.2 mts with a longitudinal joint along the centre. Design the dimensions and spacings of the tie bar. The other data are –
allowable working stress in tension – 1400 kg/m^2
Unit weight of concrete – 2400 kg/m^3
Coefficient of friction – 1.5
Allowable bond stress in deformed bars in concrete – 24.6 kg/m^2. **(10 Marks)**

7 a. Benkelman beam deflection studies were carried out on 15 selected points on a stretch of flexible pavement during summer season using a dual wheel load of 4085 kg at 5 kg/cm^2 pressure. The deflection values obtained in mm after making the necessary lag corrections are given below. If the present traffic consists of 750 commercial vehicles per day, determine the thickness of bituminous over lay required. If the pavement temperature during the test was 39°C and the correction factor for subsequent increase in subgrade moisture content is 1.3. Assume annual rate of growth of traffic as 7.5%. Adopt IRC guideline. 1.40, 1.32, 1.25, 1.35, 1.48, 1.60, 1.65, 1.55, 1.45, 1.40, 1.36, 1.46, 1.50, 1.52, 1.45 mm **(14 Marks)**

b. What are the causes of formation of waves and corrugations in flexible pavements? Suggest remedial measures. **(06 Marks)**

8 a. Explain various types of rigid pavement failures with neat sketches. **(10 Marks)**

b. Explain briefly the pavement evaluation. **(10 Marks)**

* * * * *

USN | | | | | | | | | | |

10CV835

Eighth Semester B.E. Degree Examination, June/July 2018
Industrial Wastewater Treatment

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Differentiate between Domestic and Industrial waste water. **(06 Marks)**

b. Discuss the factors to be considered in stream sampling. **(08 Marks)**

c. Explain the terms Effluent standards, Stream standards and Stream classification. **(06 Marks)**

2 a. Explain in detail Streeter – Phelps formulation of mathematical analysis. **(10 Marks)**

b. Obtain the DO, Deficit profile for 100km given the city discharge is 20000 m^3/day of sewage and river discharge is 0.7m^3/sec. **(10 Marks)**

Data given :

Parameter	River	Sewage effluent from STP
DO	8.2 mg/L	2.0 mg/L
Temperature	23^0C	26^0C
BOD 5d, 40^0C	3.4 mg/L	45mg/L

3 a. Explain the necessicity and process of volume reduction as a strategy in industrial waste water treatment. **(10 Marks)**

b. Discuss the terms Neutralization, Equalization, Proportioning and By – product recovery. **(10 Marks)**

4 a. Explain the unit operations adopted for removal of suspended solids and inorganic solids. **(10 Marks)**

b. Explain with a neat sketch, suspended growth biological process. **(10 Marks)**

PART – B

5 a. Combined treatment in common effluent treatment facility is very effective for industrial estates. Discuss the reasons and consequences. **(10 Marks)**

b. Explain the effects of discharging treated and partially treated waste water into rivers. **(10 Marks)**

6 a. Draw a neat flow diagram to show the points of generation of wastes in a cotton textile mill and explain. **(10 Marks)**

b. How does Tannery waste affect the water bodies? Explain the production and treatment of waste water with a flow diagram. **(10 Marks)**

7 a. Discuss the effects of dairy waste on streams and propose a treatment strategy for prevention of effects on a river. **(10 Marks)**

b. How is ecology of estuaries affected by establishing cannery for fish export industry? Explain. **(05 Marks)**

c. Give the sources of effluents from a cement manufacturing process. **(05 Marks)**

8 a. Draw a neat flow diagram for the manufacture of paper and pulp and give a treatment strategy for the combined waste. **(10 Marks)**

b. Give the strategy of treating using bacteria for antibiotic waste from a pharmaceutical industry. **(05 Marks)**

c. Effective maintenance of food to micro – organism ratio is essential for treating industrial wastes. Explain. **(05 Marks)**

*****

USN | | | | | | | | | | |

10CV847

Eighth Semester B.E. Degree Examination, June/July 2018
Environmental Impact Assessment

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define EIA and with the help of flow chart, explain relationship between EIA, EIS and FONSI. **(10 Marks)**

b. Explain the need of EIA studies. **(05 Marks)**

c. Explain the major components of Baseline Information. **(05 Marks)**

2 a. With the help of neat flow chart, explain the step – by – step procedure for conducting EIA. **(12 Marks)**

b. Explain the various limitations of EIA. **(08 Marks)**

3 a. Describe the frame work of environmental impact assessment with the help of flow chart. **(10 Marks)**

b. Explain in detail the check list and Network methodologies of EIA. **(10 Marks)**

4 a. Explain the basic step for Prediction and Assessment of impact on water. **(10 Marks)**

b. Discuss the various steps involved in Assessment and prediction of impact on socio – Economic Environment. **(10 Marks)**

PART – B

5 a. Outline the MoEF guidelines for developmental projects. **(10 Marks)**

b. Explain REIA, CEIA, DEIS and FEIS. **(10 Marks)**

6 a. Define Public participation. What are the advantages and disadvantages of public participation? **(10 Marks)**

b. Explain the practical considerations in writing impact statements. **(10 Marks)**

7 a. Outline the salient features of the project activity and environmental parameters relationship. **(10 Marks)**

b. Briefly explain the Leopold matrix. **(10 Marks)**

8 List the Environmental impacts of :

a. Water resource development project. **(05 Marks)**

b. Mining project. **(05 Marks)**

c. Highway project. **(05 Marks)**

d. Infrastructure construction activities. **(05 Marks)**

*****

CBCS SCHEME

USN | | | | | | | | | | |

15CV82

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Design of Prestressed Concrete Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS 1343-1980 is permitted.

Module-1

1 a. Explain the need for High Strength conc and higher grade steel for PSC member. **(04 Marks)**

b. Define Pre-stressed Concrete. Explain the different types of Pre-stressed Concrete. **(04 Marks)**

c. A PSC inverted T beam section web 300×900mm. Flange 300×600mm simply supported over a span of 15m. The beam is tensioned by 3 cables each containing 12 wires of 7 mm diameter placed at 150mm from soffit at midspan. If the initial prestress is 1000 N/mm^2 calculate the max UDL the beam can carry maximum compressive stress is limited to 15 MPa and tensile stress is limited to 1 MPa. Assume 15% loss of pre stress. **(08 Marks)**

OR

2 a. Explain Load Balancing Concept. **(02 Marks)**

b. Explain post tensioning anchorages devices and explain any one in details. **(06 Marks)**

c. A rectangular beam 200×300mm is pre-stressed by 15 wires of 5 mm diameter located at 65mm from bottom and 3 wires of 5mm diameter at 25mm from top initial pre-stress is 840 N/mm^2. Calculate stress at midspan. **(08 Marks)**

Module-2

3 a. Define loss of pre-stress. Explain different loss of pre-stress with suitable example. **(06 Marks)**

b. A post tensioned concrete beam 100×300mm span 10m is pre-stressed successively, tensioned and anchored by 3 cables each having C/S area 200 mm^2. Initial pre stress is 1200 N/mm^2. First cable is parabolic with e = 50mm at mid span and e = 50mm above NA at support. Second cable is parabolic with e = 50 at midspan and zero at support. Third cable is straight cable with 50mm eccentricity. Find the loss of pre-stress due to elastic deformation. Take m = 6. **(10 Marks)**

OR

4 a. Derive the expression for deflection for a beam of length *l* subjected to point load at mid span, UDL. Two point load symmetrically placed at middle third point. Prestress P applied on a straight cable with e as eccentricity and a parabolic cable with e = 0 at support and e at mid span. **(06 Marks)**

b. A simply supported beam having span 6m is post tensioned by 2 cable both having e = 50mm at mid span. First cable is parabolic and anchored 100mm above CG at support. Second cable is straight. C/s of each cable is 200mm^2 and initial prestress is 1200 N/mm^2. Area of cone 2×10^4 mm^2 radius of gyration 120mm. The beam support a two point load each 20 kN at middle third point E_C 38 kN/mm^2. Calculate (i) Short term deflection (ii) Long term deflection .Take $\phi = 2$, Loss of prestress 20%. **(10 Marks)**

Module-3

5 An unsymmetrical I section having top flange 750×200mm bottom flange 450×250mm thickness of web 150mm overall depth 1000mm. If permissible tensile and compressive stress at transfer and working load are not to exceed zero in tension 15 N/mm^2 in compression. Determine P and e to resist self weight and applied moment 1012 kNm and 450 kNm. Assume loss of pre stress 15%. **(16 Marks)**

OR

6 Design a post tensioned girder which is spaced 2.4 m c/c and has an effective span of 9m. Live load 15 kN/m^2, DL(3 kN/m^2 + Self weight). Compressive stress at transfer and working load are 14 N/mm^2 and 12 N/mm^2 tension is 1 N/mm^2 at all stages of loading loss Ratio 0.8. Determine number of 7mm diameter wires required if permissible tension is 1000 N/mm^2. Assume cover as 100 mm. **(16 Marks)**

Module-4

7 a. Explain types of shear cracks. **(04 Marks)**

b. A PSC beam 250mm wide 150mm deep is subjected to SF 900 kN fiber stress under working load is 4 N/mm^2 effective pre-stress is 1000 N/mm^2 and area of cable is 1500 mm^2. Design shear reinforcement slope of cable at support is (1/6). **(12 Marks)**

OR

8 A pre-stressed concrete beam of span 10m, cross section 120mm × 300mm is prestressed by a cable carrying a force of 180 kN the beam support a UDL 5 kN/m including self weight compare the magnitude of principal tension with and without axial pre-stress. Estimate the reduction in principal stress. Also find % reduction if a parabolic cable used with e = 50 mm at mid span and zero at support. **(16 Marks)**

Module-5

9 a. Explain stress distribution in End Block. **(04 Marks)**

b. Explain Indian Standard Code IS-1343 method for calculation of Burstire force. **(04 Marks)**

c. The end block of a post tensioned pre-stressed concrete beam 300mm × 300mm is subjected to a pre-stressing force 832.8 kN. Anchorage area 11720 mm^2. Design suitable anchorage reinforcement. **(08 Marks)**

OR

10 a. Explain composite construction in PSC members. **(06 Marks)**

b. A composite T beam is made up of pre tensioned web 100mm wide 200mm deep and a cast insitu slab 400mm wide 40mm thick having a modulus of elasticity 28 kN/mm^2. If the differential shrinkage is 100×10^{-6} units determined shrinkage stresses developed in the precast and cast insitu units. **(10 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV81

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Quantity Surveying and Contracts Management

Time: 3 hrs. Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 Prepare a detailed estimate for a residential building shown in Fig.Q1, for the following items of work:
(i) Earthwork excavation for foundation in hard soil
(ii) BBM walls with CM 1:6 for super structures
(iii)Cement plaster (1:3), inside and outside walls.

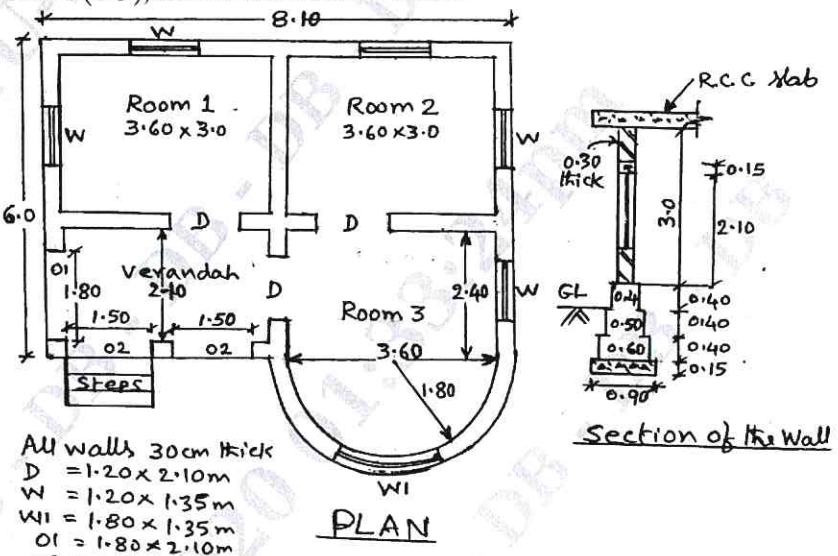


Fig.Q1 **(16 Marks)**

2 Estimate the cost of RCC roof slab in C.C 1:1½ :3 over a room of internal dimension 3.2m × 4.2m. Calculate the quantity of concrete and steel reinforcement. Given : Slab thickness = 150mm, Two-way slab. Steel requirement : Main steel = 10mmϕ @ 150 mm c/c Secondary steel : 8mmϕ @200mm c/c. Alternate bars cranked at one end only. TMT bars used, hence provide L-bind at ends. Wall thickness = 200 mm, Cost of concrete = Rs. 12,000/m^3. Cost of steel bars = Rs. 50/kg. **(16 Marks)**

Module-2

3 The details of manhole is given in Fig.Q3. Find its quantities of the following items:
(i) Earth work excavation for foundation in hard soil.
(ii) B.B.M in CM 1:4 for walls
(iii) RCC roof vocering slab in C.C. 1:2:4
(iv) Plastering in CM 1:3 for inside walls.
(v) Bed concrete in CC 1:3:6 **(16 Marks)**

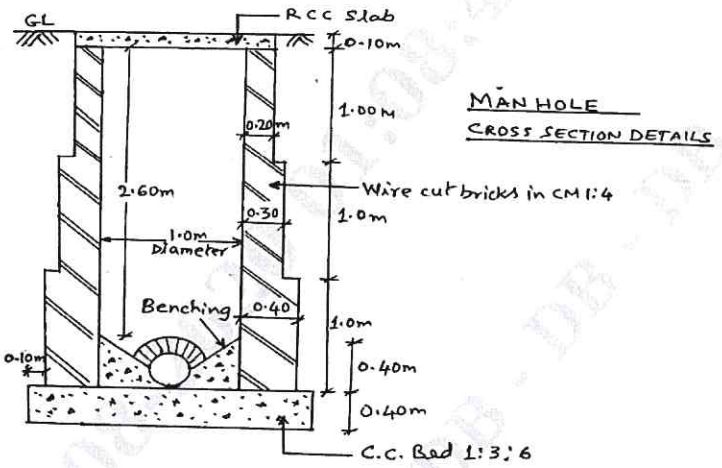


Fig.Q3

4 Estimate the quantities of earthwork from chainage 70 to 76 measured with a standard 20 m chain from the following data. Use mean sectional area method. Side slopes 1:1 in cutting and 2:1 in banking. Formation width of road is 12m. Draw the longitudinal section of the proposed road.

Chainage	70	71	72	73	74	75	76
Ground level (m)	88.10	87.74	87.80	88.20 90.40	90.75	90.20	89.98
Formation level (m)	88.50	Raising gradient 1 in 100 ⟶					

(16 Marks)

Module-3

5 a. Mention the objectives of writing specifications. **(04 Marks)**

b. Write the detailed specifications for any two of the following :

(i) First class brickwork in superstructure in CM 1:6

(ii) Bed concrete in foundation in C.C.(1:4:8)

(iii) Distempering two coats with a coat of primor **(12 Marks)**

6 a. Mention the factors affecting rate of item of work. **(04 Marks)**

b. Workout from first principles the rate per unit for any two of the following :

(i) Size stress masonry in CM 1:6 for Plinth

(ii) 12mm thick plastering for inside walls in CM 1:6

(iii) R.C.C work for beam in C.C. (1 : 1½ : 3) **(12 Marks)**

Module-4

7 a. Define :

(i) Running bill (ii) Secured Advance (iii) Advance payment

(iv) Voucher (v) Quotation (vi) Contractor **(06 Marks)**

b. What are the different types of contract? Explain any two. **(05 Marks)**

c. Explain briefly the reasons in which he contract can be terminated. **(05 Marks)**

8 a. What are the advantages and disadvantages of Lump-Sum contract? **(06 Marks)**

b. Explain Tender Notice. List the essential information given along with tender notice. **(05 Marks)**

c. Write the elements of standard tender document. **(05 Marks)**

Module-5

9 a. What is measurement book? What are the rules to be followed in recording measurement book? **(08 Marks)**

b. A building is situated by the side of a main road. The built up portion is 20m × 15m. The building is of first class type and provided with water supply, sanitation and electric fitting. Age of the building is 30 years. Workout the valuation of the property. Area of land on which building stands is $500m^2$. Assume plinth area rate as Rs $20,000/m^2$, life of the building 100 years and cost of land, Rs. $2500/m^2$. **(08 Marks)**

10 a. Define (i) Obsolescence (ii) Sinking fund (iii) Depreciation (iv) Mortgage (v) Scrap value (vi) Leasehold property. **(06 Marks)**

b. A person has purchased a plot of land costing Rs. 8,00,000/- and has constructed a building there on at a total cost of Rs. 20 lakh including water supply, sanitary and electrical installation etc. Allowing a net return @ 7% on the cost of construction and @ 5% net return on the cost of land, workout the standard rent of the property with the following data:

(i) Sinking fund on 4% basis for the future life of 75 years = 0.0022

(ii) Annual maintenance 0.5% of the cost of construction

(iii) Municipal taxes and other outgoings @ 28% of the gross rent. **(10 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV81

Eighth Semester B.E. Degree Examination, November 2020
Quantity Surveying and Contract Management

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions irrespective of modules.

Module-1

1 The details of a residential building is shown in Fig.Q1. Estimate the quantities and cost of each item of works.
(i) Earthwork in excavation for Foundation in hard soil @ Rs. 380/m^3.
(ii) Plain cement concrete 1 : 3 : 6 for bed of the foundation @ Rs. 3000/m^3.
(iii) Size stone masonry with CM 1 : 6 for footings and basement @ Rs. 2200 / m^3
(iv) First class Brickwork with burnt brick masonry CM 1:6 in super structure @ Rs. 4500/-

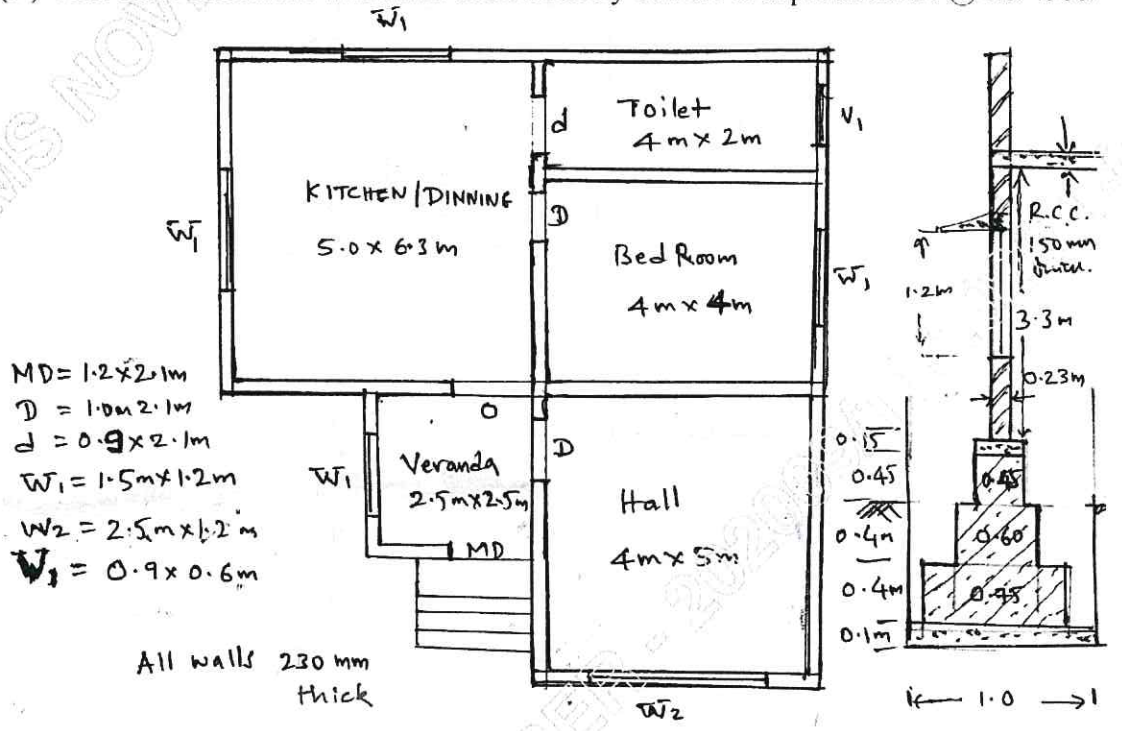


Fig.Q1 **(16 Marks)**

2 Explain the purpose of estimation. List any two types of estimates and explain. **(16 Marks)**

Module-2

3 The details of septic tank are shown in Fig.Q2. Estimate the quantities of follows item and cost.
(i) Earth work in excavation @ Rs. 380/m^3
(ii) P.C.C. 1:3:6 for bed @ Rs. 3000/m^3
(iii) BBM in CM 1:4 for all walls @ 4500/m^3
(iv) R.C.C. 1 : 1.5 : 3 for cover of the tank @ Rs. 5500/m^3.

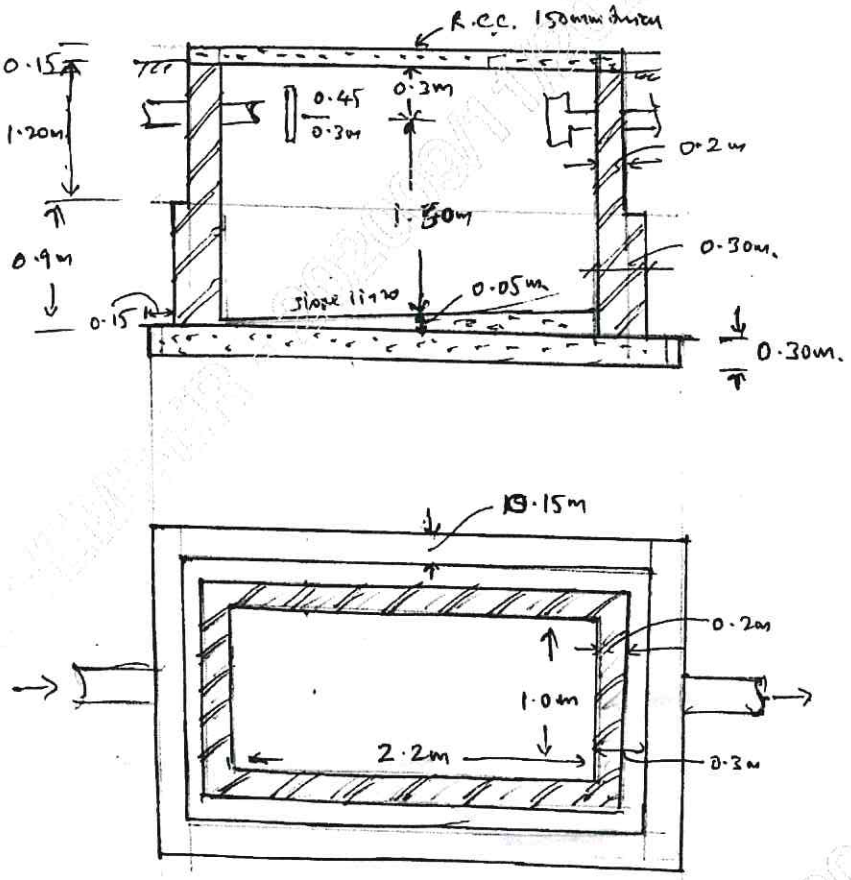


Fig.Q2 **(16 Marks)**

4 Reduced levels of ground along a proposed road is given in the table the formation level at 1st chain is 108 and the road is in downward gradient of 1:150 up to the chainage four and then gradient changes to 1 : 100 downward formation width of road is 10m side slopes 2:1(H:V) Length of chain 30m. Estimate the quantities of earthwork.

Chainage	0	1	2	3	4	5	6	7	8	9	10
RL of ground	106	106.6	106.44	106.9	106.42	105.3	106	105.1	105.62	105	104.3

(16 Marks)

Module-3

5 Write detailed specifications for following :
(i) Plain cement concrete in bed of foundation
(ii) Size stone masonry in CM 1:6
(iii) Reinforced cement concrete M_{20} grade (1 : 1½ : 3)
(iv) Painting plastered surface including preparation of surface. **(16 Marks)**

6 Carry out the Rate Analysis for
(i) Plain cement concrete 1 : 3 : 6
(ii) Burnt Brick Masonry in CM 1 : 6.
(iii) Plastering with cement mortar CM 1 : 4
(iv) Painting the cement plastered walls with 2 coats putty and 2 coats paint. **(16 Marks)**

Module-4

7 What is Tender? Explain the departmental procedure of tendering civil works. **(16 Marks)**

8 Explain (i) Prequalification
(ii) Bid submission and Evaluation process
(iii) Law of contract
(iv) Contract forms. **(16 Marks)**

Module-5

9 Explain (i) Mobilization and equipment advance
(ii) Secured advance
(iii) Liquidated damages and bonus
(iv) Dispute resolution mechanism. **(16 Marks)**

10 What is valuation? Explain the methods of valuation of buildings. **(16 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV82

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Design of Prestressed Concrete Structural Elements

Time: 3 hrs. Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Distinguish between pretensioning and post tensioning. **(05 Marks)**

b. Explain why high strength steel and high strength concrete are used in prestressed concrete. **(06 Marks)**

c. Explain with a neat sketch "Hoyer's long line" system of pre-tensioning. **(05 Marks)**

2 A pretensioned concrete beam having an unsymmetrical I-section having overall depth 1300mm, top flange 600mm wide and 250mm thick, bottom flange 350mm wide and 300mm thick and thickness of web is 150mm is used to support live load of 11kN/m over a span of 30m. The prestressing force of 3200kN is located at an eccentricity of 580mm at the centre of span section. Determine the extreme fibre stresses at mid span section when the beam supports dead and live loads assuming the loss of prestress is 15 percent. **(16 Marks)**

Module-2

3 a. How do you estimate the loss of prestress due to
i) Elastic deformation
ii) Shrinkage of concrete
iii) Creep of concrete. **(06 Marks)**

b. A pretensioned beam 250mm wide and 360mm deep is prestressed by 10 wires of 8mm diameter initially stressed to 1000N/mm^2. The centroid of the steel wires is located at 105mm from the soffit. Determine the maximum stress in concrete immediately after transfer allowing elastic shortening of concrete only at the level of the centroid of steel.
If however the concrete is subjected to additional shortening due to creep and shrinkage and the steel is subjected to a relaxation of stress of 5 percent. Find the final percentage of loss of prestress in the steel wires.
Take E_s = 210kN/mm^2, E_c = 36.85kN/mm^2, Creep coefficient = 1.60. Total residual shrinkage strain = 3×10^{-4}. **(10 Marks)**

4 a. What are the factors affecting deflection of a PSC beam? **(06 Marks)**

b. A prestressed concrete beam of rectangular section 120mm wide and 300mm deep, span over 6m. The beam is prestressed by a straight cable carrying an effective force of 200kN at an essentricity of 50mm. The modulus of elasticity of concrete is 38kN/mm^2.
Compute the deflection at centre of span for the following cases:
i) Deflection under prestress + self weight
ii) Find the magnitude of uniformly distributed live load which will nullify the deflection due to prestress and self weight. **(10 Marks)**

Module-3

5 a. What are the different flexural failure modes observed in prestressed concrete beam? Explain with sketches. **(06 Marks)**

b. A post tensioned bridge girder with unbounded tendons is of box section of overall dimensions 1200mm wide × 1800mm deep with wall thickness 150mm. The high tensile steel has an area of 4000mm^2 and is located at an effective depth of 1600mm. The effective prestress in steel after all losses is 1000N/mm^2 and the effective span of the girder is 24m. If f_{ck} = 40N/mm^2 and f_p = 1600N/mm^2, estimate the ultimate flexural strength of the section. **(10 Marks)**

6 Design a post tensioned prestressed concrete roof girder to suit the following data:

Effective span = 20m

Live load = 12kN/m

f_{ck} = 50N/mm^2

f_{ct} = 41N/mm^2

lose ratio = 0.85

Cable containing 12 wires of 7mm diameter (f_p = 1500N/mm^2) are available for use. Design the girder as Type-1 member to confirm IS1343. **(16 Marks)**

Module-4

7 a. Explain different methods of improving shear resistance of PSC members. **(06 Marks)**

b. A prestressed girder of rectangular section 150mm wide shear force of 130kN. The uniform prestress across the section is 5N/mm^2. Given the characteristic strength (cube) strength of concrete is 40N/mm^2 and Fe-415 HYSD bars of 8mm diameter, design suitable spacing for the stirrups confirming to Indian standard code IS-1343 recommendations. Assume cover to the reinforcement as 50mm. **(10 Marks)**

8 a. Explain mechanism of shear failure in PSC beams. **(06 Marks)**

b. The horizontal prestress at the centroid of a concrete beam of rectangular section 120mm × 250mm is 7N/mm^2 and the maximum shearing force on the beam is 70kN. Calculate the maximum principal tensile stress, what is the maximum vertical stress required to eliminate this principal stress? **(10 Marks)**

Module-5

9 a. Write a note on zone stresses. **(06 Marks)**

b. The end block of a prestressed concrete girder is 200mm wide × 300mm deep. The beam is post tensioned by two Freyssinet anchorage each of 100mm diameter with their centres located at 75mm from top and bottom of beam. The force transmitted by each anchorage being 2000kN. Compute the bursting force and design suitable reinforcements according to IS1343, sketch the arrangement of anchorage zone reinforcement. **(10 Marks)**

10 The mid section of a composite T beam comprises a pretensioned beam 300mm wide and 900mm deep and an in-situ cast slab 900mm wide and 150mm deep. The effective prestressing located 200mm from the soffit of the beam is 2180kN. The moment due to the weight of the precast section is 273kN-m at mid span. After this is erected in place, the top slab is cast producing a moment of 136.5kN-m at midspan.

After the slab concrete is hardened, the composite section is to carry a maximum live load moment of 750kN-m. Compute the resultant final stresses at

i) The top of slab

ii) The top and bottom of precast section. **(16 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV82

Eighth Semester B.E. Degree Examination, November 2020
Design of Prestressed Concrete Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions irrespective of modules.
2. Use of IS1343-1980 is permitted.

Module-1

1 a. Explain the need for High strength concrete and Higher grade steel for PSC members. **(06 Marks)**

b. A prestressed concrete beam of section 200mm wide by 300mm deep is used over an effective span of 6m to support an imposed load of 4kN/m. The density of concrete is 24kN/m^3. At the centre of span section of the beam, find the magnitude of the concentric prestressing force necessary for zero fibre stress at the soffit when the beam is fully loaded. **(10 Marks)**

2 a. Distinguish between pretensioning and post tensioning. **(06 Marks)**

b. A simply supported prestressed concrete beam spanning over 10m is of rectangular section 500mm wide and 750mm deep. The beam is prestressed by a parabolic cable having eccentricity of 200mm at the centre of the span and zero at the end supports. The effective force in the cable is 1600kN. If the beam supports a total uniformly distributed load of 40kN/m which includes the self weight. Evaluate the extreme fibre stresses at the midspan section using internal resisting couple method. **(10 Marks)**

Module-2

3 a. Name the various types of loss of prestress. **(06 Marks)**

b. A prestressed concrete beam, 200mm wide and 300mm deep is prestressed with wires (area = 320mm^2) located at a constant eccentricity of 50mm and carrying an initial stress of 1000N/mm^2. The span of the beam is 10m. The beam is pretensioned. Calculate the loss of stress in wires using the following data E_s = 210 kN/mm^2, E_s = 35kN/mm^2, Relaxation of steel stress = 5% of initial stress. Shrinkage of concrete is 300×10^{-6}. Creep coefficient = 1.6. **(10 Marks)**

4 a. What are the factors influencing the deflections of prestressed concrete members? **(06 Marks)**

b. A concrete beam with a rectangular section 100mm wide and 300mm deep, is stressed by three cables, each carrying an effective force 240kN. The span of the beam is 10m. The first cable is parabolic with an eccentricity of 50mm below the centroidal axis at the centre of the span and 50mm above the centroidal axis at the supports. The second cable is parabolic with zero eccentricity at the supports and an eccentricity of 50mm below the centroidal at the centre of span. The third cable is straight with a uniform eccentricity of 50mm below the centroidal axis. The beam supports a uniformly distributed live load of 5kN/m, E_c = 38kN/mm^2. Estimate the instantaneous deflection at the following stage: prestress + self weight + live load. **(10 Marks)**

Module-3

5 a. What are the different types of flexural failures observed in PSC members? **(04 Marks)**

b. A post tensioned prestressed concrete Tee beam having a flange width of 1200mm and flange thickness of 200mm, thickness of web being 300mm is prestressed by 2000mm^2 of high tensile steel located at an effective depth of 1600mm. If f_{ck} = 40N/mm^2 and f_p = 1600N/mm^2, estimate the ultimate flexural strength of the unbounded tee section, assuming span/depth ratio as 20 and f_{pe} = 1000N/mm^2. **(12 Marks)**

6 a. What are the factors which influences the flexural failures in PSC members? **(04 Marks)**

b. Estimate the effective prestress, area of prestressing steel and the area of the section from preliminary design for a simply supported Type 1 prestressed beam with M_T = 435kNm (including an estimated M_{sw} = 55kNm). The height of the beam is restricted to 920mm. The prestress at service f_{pe} = 860N/mm^2. The allowable compressive stress of concrete at service is 11.0N/mm^2. **(12 Marks)**

Module-4

7 a. Name three ways of improving the shear resistance of structural concrete members by prestressing techniques. **(03 Marks)**

b. A concrete beam of rectangular section has a width of 250mm and depth of 600mm. The beam is prestressed by a parabolic cable carrying an effective force of 1000kN. The cable is concentric at supports and has maximum eccentricity of 100mm at the centre of span. The beam spans over 10m and supports a uniformly distributed live load of 20kN/m. Assuming the density of concrete as 24kN/m^3 estimate the maximum principal stress developed in the section of the beam at a distance 300mm from the support. **(13 Marks)**

8 a. Name the modes of failure due to shear. **(03 Marks)**

b. A prestressed girder of rectangular section 150mm wide by 300mm deep is to be designed to support an ultimate shear force of 130kN. The uniform prestress across the section is 5N/mm^2. Given the characteristic cube strength of concrete as 40N/mm^2 and Fe415 HYSD bars of 8mm diameter, design suitable spacing for the stirrups confirming to IS1343. Assume cover to the reinforcement = 50mm. **(13 Marks)**

Module-5

9 a. Write note on Anchorage zone. **(03 Marks)**

b. The end block of a post tensioned prestressed member is 550mm wide and 550mm deep. Four cables each made up of seven wires of 12mm diameter stands and carrying a force of 1000kN are anchored by plate anchorages, 150mm by 150mm, located with their centres at 125mm from the edges of the end block. The cable duct is of 50mm diameter. The 28 day cube strength of concrete of concrete fcu is 45N/mm^2. The cube strength of concrete of concrete at transfer fci is 25N/mm^2. Permissible bearing stresses behind anchorages should confirm with IS:1343. The characteristic yield stress in mild steel anchorage reinforcement is 260N/mm^2. Design suitable anchorages for the end block. **(13 Marks)**

10 a. Write note on composite construction in PSC. **(03 Marks)**

b. A composite T-beam is made up of a pretensioned rib 100mm wide and 200mm deep and cast in situ slab 400mm wide and 40mm thick having a modulus of elasticity of 28kN/mm^2. If the differential shrinkage is 100×10^{-6} units determine the shrinkage stresses developed in the precast and cast in situ units. **(13 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV833

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Pavement Design

Time: 3 hrs. Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Briefly explain the Pavement Components and functions of components. **(04 Marks)**

b. Write comparison between Flexible and Rigid Pavement. **(04 Marks)**

c. Explain briefly Design factors to be considered in the design of pavement. **(08 Marks)**

2 a. List and briefly explain the assumptions and limitations of Bousinerq's theory. **(08 Marks)**

b. Design the thickness of a flexible pavement by Bunmister's two layer analysis for a wheel load of 40 kW and a tyre pressure of 0.5 MN/m^2. The modulus of elasticity of the pavement materials is 150 MN/m^2 and that of the subgrade is 30 MN/m^2. **(08 Marks)**

Module-2

3 a. With a sketch describe the significance of design wheel load and contact pressure in design of pavement. **(04 Marks)**

b. Explain the concept of Equivalent Single Wheel Load (ESWL). **(04 Marks)**

c. Calculate the design repetition for 20 years period for wheel load equivalent to 2268 kg wheel load using the following traffic survey data on a four lane road.

Wheel load (kg)	Average daily traffic ADT in both directions	% of total traffic volume
2268		13.17
2722	Total volume	15.30
3175	215	11.76
3629	Considering traffic growth	14.11
4082		6.21
4532		5.84

(08 Marks)

4 a. Design a highway pavement using McLeod method of wheel load 6000 kg with tyre pressure of 6 kg/cm^2. The plate load test conducted on subgrade soil using 30 cm dia plate yield a pressure 2.8 kg/cm^2 after 10 load repetitions at 0.5 cm deflection. **(08 Marks)**

b. In a dual wheel assembly the load on each wheel is 32 kN tyre pressure is 0.6 N/mm^2 and c/c wheel spacing 410 mm. The load is placed on a pavement 500 mm thick. The subgrade characterized by E = 20 N/mm^2 and $\mu = 0.5$. Calculate the deflection on the top of subgrade at the radial distance of 0.15 and 250 from the centre of left wheel measured towards other wheel using deflection chart. **(08 Marks)**

Module-3

5 a. Explain typical failures of flexible pavement. **(08 Marks)**

b. Briefly explain the various maintenance works of bituminous surfaces. **(08 Marks)**

6 Write notes on:
a. Roughness measurement **(04 Marks)**
b. Falling Weight Deflectometer **(04 Marks)**
c. Benkelman beam deflection method **(08 Marks)**

Module-4

7 a. Explain:
(i) Radius of relative stiffness
(ii) Equivalent radius of resisting section
(iii) Critical load position **(08 Marks)**
b. A cement concrete pavement of 25 cm thickness is constructed over a granular surface having modulus of reaction 10 kg/cm^3. The maximum temperature different between the top and bottom of the slab during winter is found to be 15°C. The spacing between the transverse joint is 7.5 m. Find the worst combination of stresses at the edge and corner regions. **(08 Marks)**

8 a. Write the step by step procedure for the design of concrete pavement as recommended by IRC 52.2002. **(08 Marks)**
b. Design the size and spacing of dowel bar at the expansion joints of a cement concrete pavement of thickness 25 cm with radius of relative stiffness 80 cm. For a design wheel load of 5000 kg. Assume load capacity of the dowel system as 40% of the design wheel load joint width is 2 cm, permissible shear and flexural stress in the dowel bar are 1000 and 1400 kg/cm^2 and permissible bearing stresses in cement concrete is 100 kg/cm^2 diameter of dowel bar = 2.5 cm. **(08 Marks)**

Module-5

9 a. Explain the failures in Rigid Pavement. **(08 Marks)**
b. Explain different methods of pavement evaluation. **(08 Marks)**

10 a. List the types of joints and explain briefly. **(08 Marks)**
b. List and explain the desirable properties of subgrade. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV833

Eighth Semester B.E. Degree Examination, November 2020
Pavement Design

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions irrespective of modules.
2. Use of IRC charts is permitted.

Module-1

1 a. Describe the characteristics of a pavement for efficient performance structurally and functionally. **(08 Marks)**

b. What are the major differences between Flexible and Rigid pavements? **(08 Marks)**

2 a. Determine the thickness of pavement by single layer elastic theory so as to limit deflection of subgrade to 5mm due to
(i) Wheel load of 50 kN and contact pressure of 0.7 N/mm^2 due to truck loading.
(ii) Wheel load of 5 kN and a contact pressure of 5 kN/mm^2 due to bullock cart loading. **(08 Marks)**

b. A plate bearing test was conducted with 30 cms plate dia on soil subgrade and on 15cm base curve. The pressure yielded at 0.5 cm deflection are 1.25 kg/cm^2 and 4 kg/cm^2. Design a pavement section of 5 kg/cm^2 for allowable deflection of 0.5cm using Burmister's approach. **(08 Marks)**

Module-2

3 a. What are the major factors affecting the pavement design? Explain briefly. **(08 Marks)**

b. Calculate the design repetition for 20 years period for various wheel loads equivalent to 2268 kg wheel load using the following data on a 4 lane load. The average daily traffic in both the way 215.

Wheel load kg	2268	2722	3175	3629	4082	4596
% of total traffic volumes	13.17	15.30	11.76	14.11	6.21	5.84

(08 Marks)

4 a. It is proposed to widen an existing 4 lane NH section to 3 lane dual carriage way road. Design the pavement for new carriageway for the following data:
Initial traffic for both directions is 4900 CVPD. Expected growth rate 8%. Design CBR =7% , VDF = 4.5 , Design life = 15 years. **(08 Marks)**

b. Design the pavement by KANSAS Triaxial method given.
E of subgrade = 90 kg/cm^2 ; E of paving material = 900 kg/cm^2 ; Wheel load = 5100 kg ; Tyre pressure = 7 kg/cm^2 ; x = 1.5 cm , y = 0.8 cm. Calculate the thickness of pavement layers of base course and sub-base course to be provided wing having an E value of 400 and 200 kg/cm^2 respectively. **(08 Marks)**

Module-3

5 a. What are the major structural and functional failures in flexible pavements? Explain each of them briefly. **(10 Marks)**

b. Explain briefly the procedure of functional evaluation (Roughness) of flexible pavement using Bump-Integrator. **(06 Marks)**

6 a. Explain the brief procedure for structural evaluation of a flexible pavement by Benkelman Beam Deflection Studies with a neat sketch of components. **(10 Marks)**

b. Explain the major factors affecting the design of a runway at Airports. **(06 Marks)**

Module-4

7 a. What are the various types of stresses acting on a rigid pavement? Briefly explain the concept of 'warping' of cement concrete slab with a neat sketch. **(08 Marks)**

b. A concrete slab 7.5m long, 3.5m wide and 200mm thick is subjected to a temperature differential of 12°C. Assume 'K' as 54 MN/m^3, $\alpha = 10\times10^{-6}/°C$. Determine the warping stress at interior, edge and corner region of slab. Take E = 30 GPa, $\mu = 0.15$, Radius of loaded area = 150 mm. **(08 Marks)**

8 a. What are the major factors affecting the design of a cement concrete pavement? Explain briefly. **(06 Marks)**

b. Design a dowel bar system for a cement concrete slab for the following conditions:
Design wheel = 4100 kg ; Design load transfer = 40% ; Slab thickness h = 20 cm ;
Joint width = 2 cm ; Permissible flexural stress in dowel bar = 1400 kg/cm^2 ;
Permissible shear stress = 1000 kg/cm^2 ; Permissible bearing stress in concrete = 100 kg/cm^2
K value of subgrade = 8 kg/cm^3 ; $E = 3\times10^5$ kg/cm^2 ; $\mu = 0.15$ **(10 Marks)**

Module-5

9 a. What are the various types of failure in the Rigid pavement? Explain them briefly. **(10 Marks)**

b. Describe the major characteristics of Joints in cement concrete pavement. State the need for joints. **(06 Marks)**

10 a. Explain briefly the various remedial measures that can be adopted in maintenance of rigid pavement. **(06 Marks)**

b. What are the various types of joints in CC pavements? Explain them briefly with neat sketches. **(10 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV81

Eighth Semester B.E. Degree Examination, July/August 2021
Quantity Surveying and Contracts Management

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions.

1 The details of a residential building is shown in Fig.Q1. Estimate the quantities and the cost of the following items of works.

a. Earth work excavation for foundation in or ordinary soil @ Rs. 250/- per cum.
b. UCRM in foundation in CM 1:6 @ Rs. 1200/- per cum
c. BBM in Superstructure in CM 1:6 @ Rs. 5500/- per cum.
d. Plastering to masonry inside in CM 1:6 12mm thick @ Rs 150/- per sqm. **(16 Marks)**

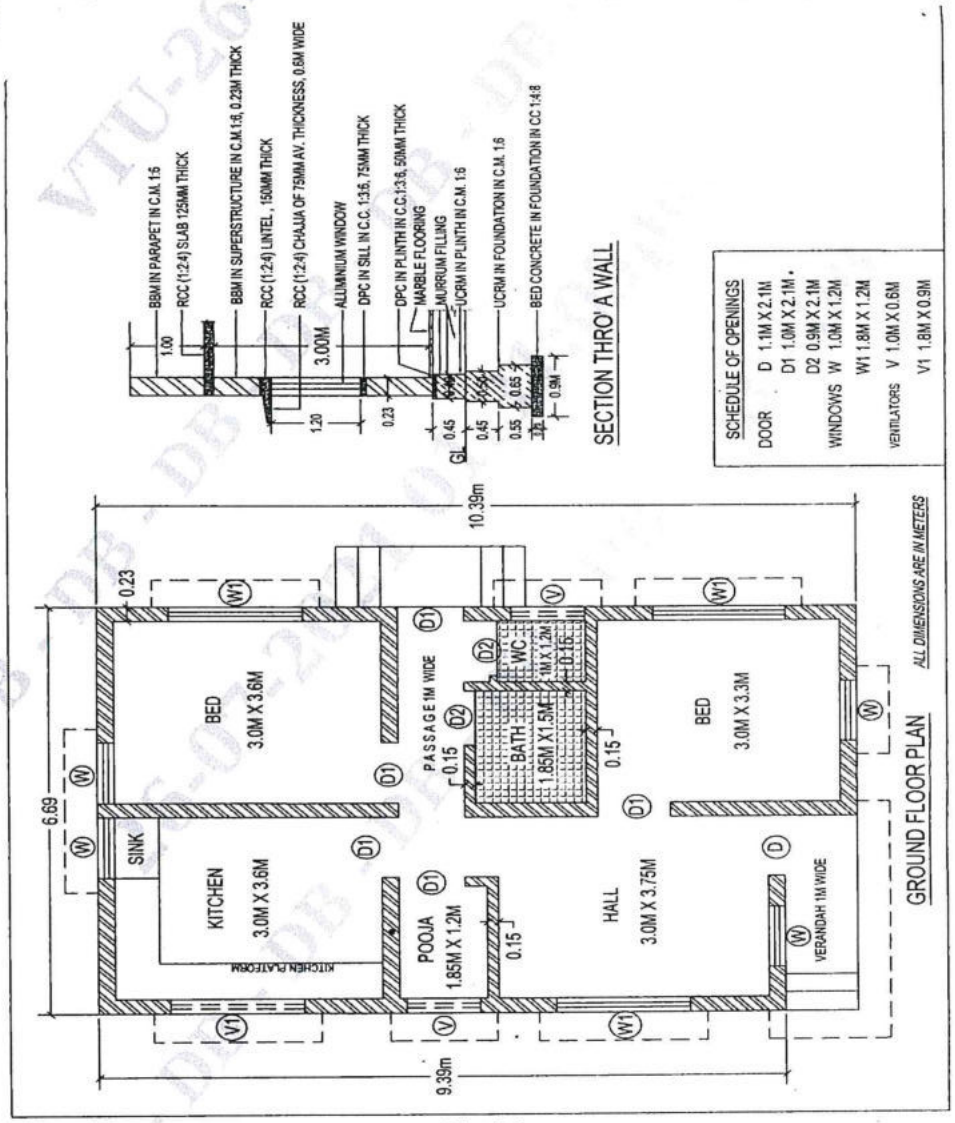


Fig.Q1

2 a. What do you mean by estimate? Why estimation is necessary? Discuss the documents involved for preparing an estimate. **(08 Marks)**

b. What are the types of estimate? Discuss any one of them. **(08 Marks)**

3 The details of septic tank are shown in Fig.Q3. Estimate the quantities of the following items of work and cost of abstract.

a. Earthwork excavation for foundation @ Rs. 200/- per cum

b. BBM in CM 1:4 for side walls @ Rs.5000/- per cum

c. RCC <1:1.5:8> slab without steel @ Rs.5290/- per cum.

d. Plastering to walls inside and floor @ Rs. 150/- per sqm. **(16 Marks)**

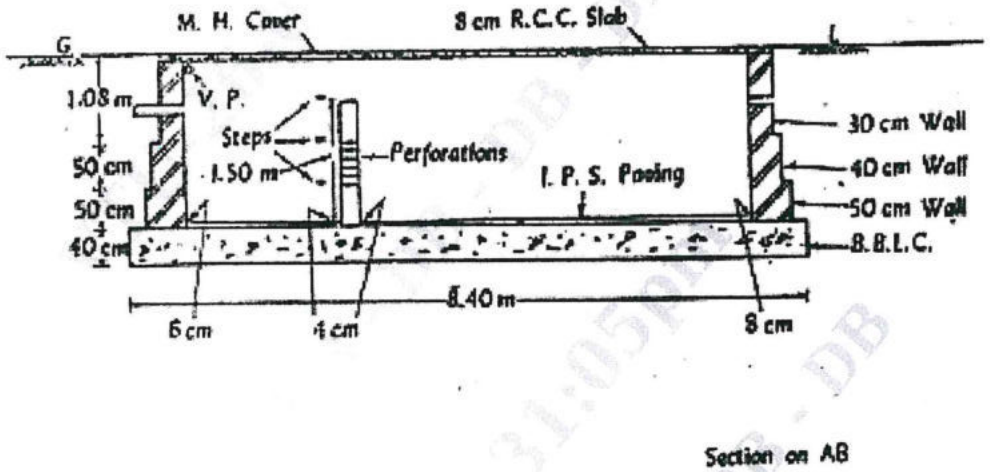


Fig.Q3

4 Prepare a detailed estimate for earthwork for a portion of road from the following data:

Distance in metres	RL of the Ground in m	RL of formation
0	114.50	115.00
100	114.75	↑
200	115.25	Upward
300	115.20	gradient
400	116.10	of 1 in 200
500	116.85	
600	118.00	↓
700	118.25	↑
800	118.10	Downward
900	117.80	gradient of
1000	117.75	1 in 400
1100	117.90	
1200	117.50	↓

Formation width is 10m, side slope in banking is 2:1 and side slope in cutting is 1.5 : 1. Formation level @ 0 chainage is 115.00. Cost of earthwork in banking @ Rs.300/- per cum cost of earth work in cutting is @ Rs. 400/- per cum. Draw longitudinal profile of the road. **(16 Marks)**

5 Write down the detailed specifications of the following :
a. Earthwork in excavation for foundation
b. Bed concrete in foundation in CC 1:4:8
c. Plastering work in CM 1:6, 12 mm thick
d. C.C. 1:3:6, flooring, 25mm thick. **(16 Marks)**

6 Work out from the first principles the rate per unit of the following items of works.
a. PCC 1:4:8 for foundation
b. Plastering in CM 1:6, 12 mm thick
c. RCC (1:1.5:3) for roof slab, 120mm thick without steel
d. BBM in CM 1:6, for Superstructure **(16 Marks)**

7 a. What are the features of the tender documents? **(10 Marks)**
b. What do you mean by breach of contract? **(06 Marks)**

8 a. What do you mean by contract? **(06 Marks)**
b. What are the types of contract? Explain any one of them briefly. **(10 Marks)**

9 Write short notes on :
a. EMD and SD
b. Market value, scrap value and salvage value
c. Sinking fund
d. Liquidated damages. **(16 Marks)**

10 a. What do you mean by Valuation? **(08 Marks)**
b. What is the purpose of Valuation? **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV82

Eighth Semester B.E. Degree Examination, July/August 2021
Design of Prestressed Concrete Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions.***
2. ***Use of IS 1343 is permitted.***

1 a. Define Prestressed Concrete. Explain briefly Pretensioned and Post tensioned members. **(03 Marks)**

b. A PSC unsummetrical I section beam span 8m support a load 20kN/m , Top flange 300 × 60mm ; Bottom flange 100 × 60mm ; Web 80 × 280mm ; P = 100kN located at 50mm from bottom. Find stress at mid span. Given A = $46.4 \times 10^3 mm^2$, NA 156mm from top $I_{xx} = 760.45 \times 10^6 mm^4$. **(05 Marks)**

c. A PSC inverted T section web 300 × 900mm , Flange 300 × 600mm , Simply supported over a span of 15m. It is tensioned by 3 cable each containing 12 wires of 7mm diameter placed at 150mm from Soffit. Calculate Max UDL the beam can carry if Max tension and compression is limited to 1MPa and 15Mpa. Loss of pre stress 15%. **(08 Marks)**

2 a. Explain Load Balancing Concept. **(03 Marks)**

b. A PSC section 400 × 600mm is prestressed by 1920kN by a parabolic cable having max eccentricity 200mm at mid span 100mm at support. Find stress at mid span only by load balancing concept. **(07 Marks)**

c. A PSC beam with single overhanging is simply supported at A, Continuous over B span AB 8m and over hanging BC 2m , C/S of beam 300 × 900mm , Live load at 3.52kN/m. Suggest a suitable cable profile. Take prestressing force 500kN. **(06 Marks)**

3 a. Define Loss of Pre-stress. Briefly explain different loss with suitable formula. **(05 Marks)**

b. A post tensioned PSC beam 250 × 400mm is prestressed by 12 wires of 7mm diameter stressed to $1200 N/mm^2$. The cable is parabolic with eccentricity 120mm at centre and zero at support span 10m. Calculate loss of pre-stress and % loss of pre-stress. Take $\mu = 0.55$, $K = 0.0015/m$, $\varepsilon_{cs} = 1.354 \times 10^{-4}$, $\phi = 1.6$, $E_s = 2 \times 10^5 N/mm^2$, $E_c = 31.6 \times 10^3 N/mm^2$. , Relaxation 5% , Slip 2mm. **(06 Marks)**

c. A post tensioned PSC member 400 × 400mm span 12m is pre-stressed by 4 – cable each having area $200mm^2$ initial pre-stress $1000 N/mm^2$. Find the loss of pre-stress when cable is tensioned one by one. Take $\varepsilon_{cs} = 0.003$, $\phi = 2.5$, $m = 6$, $\Delta = 3mm$, $E_s = 2.1 \times 10^5 N.mm^2$. Eccentricity of cable is zero. **(05 Marks)**

4 a. A simply supported 6m beam post tensioned by two cable having 100mm eccentricity below NA at centre. The first cable is parabolic with an eccentricity 100mm above NA at support. The second cable is straight. C/s of each cable is $100mm^2$. Initial pre-stress is $1200 N/mm^2$, $A = 2 \times 10^4 mm^2$, Radius of gyration 120mm. The beam support a load of 20kN each at middle third point $E_c = 38 kN/mm^2$. Calculate Short term and Long term deflection. Take $\phi = 2$. Loss of pre-stress 20%. **(10 Marks)**

b. A PSC beam 200 × 400mm span 10m is pre-stressed by a parabolic cable at 80mm from bottom at mid span and 125mm from top at support force in the cable 400kN , $E_c = 35 kN/mm^2$. Calculate i) Deflection at mid span to support its self weight.
ii) Point load to be applied at centre for zero deflection. **(06 Marks)**

5 a. A pretensioned T – section flange 1200mm × 150mm , Web 300mm × 1500mm , Steel area 4700mm^2 , located at a depth 1600mm M40 conc. Find Ultimate moment tensile strength of steel 1600N/mm^2. **(10 Marks)**

b. A post tension unbounded rectangular beam 400mm × 800mm effective depth cross sectional area of cable 2840mm^2 , Effective pre-stress 900N/mm^2 , Span 16m. Find Ultimate moment. Take M40 conc. **(06 Marks)**

6 Design a PSC beam E-span 15m live load 20kN/m , Loss of pre-stress 20% , Permissible comp stress in conc at transfer and at working load 15N/mm^2 and 12N/mm^2. No tensioned is allowed. Take b = 400mm. **(16 Marks)**

7 a. Explain Shear failure is PSC member. **(04 Marks)**

b. A post tensioned beam 200 × 400mm span 10m , Load 8kN/m , P = 500kN. The cable is parabolic with 140mm eccentricity at mid span and zero at support. Calculate
i) Principal stress at support ii) Find principal stress in absence of pre-stress. **(12 Marks)**

8 a. The cross section of a bridge girder T beam, top flange 600mm × 230mm , Web 150mm , NA is at 545mm from top of area 328500mm^2 , MI = 665 × 10^{8}mm^4 , Second moment of area , $a\bar{y} = 665 \times 10^8$ mm^3 , Span 25m , Cable area 2300mm^2 , Parabolic cable with e = 650mm at mid span and 285 at support effective pre stress 900N/mm^2 , Tensile stress is concrete 1.6N/mm^2. Find Max UDL the beam can support if load factor is 2.0. Assume no loss of pre-stress. **(08 Marks)**

b. A PSC beam 250mm × 1500mm carries an effective pre-stress 1362kN , Shear force 771kN Slope of cable at support $\theta = 1/6$, Extreme fiber stress 7N/mm^2 at top and zero at bottom principal tensile stress 0.7N/mm^2. Design Shear reinforcement. **(08 Marks)**

9 a. Explain Anchorage Zone stresses and stress distribution in end block with suitable figure. **(04 Marks)**

b. What are the methods available for calculating Anchorage Zero stress? Explain Indian Code provision. **(04 Marks)**

c. The end block of a post tensioned beam 300 × 300mm subjected to a anchorage force of 32.8kN by a Freyssinet anchorage area 11720mm^2. Design Anchorage reinforcement. **(08 Marks)**

10 a. Explain Composite Construction in PSC. Mention the advantages of precast PSC member. **(04 Marks)**

b. A precast pre-tensioned beam 100mm × 200mm E-span 5m is pre-stressed by a force of 150kN. Loss of pre-stress 15%. The beam is incorporated in a composite T beam by casting a top flange of breadth 400mm thickness 40mm. Live load 8kN/m^2. Assuming unproved condition. Find the stress developed. **(12 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV833

Eighth Semester B.E. Degree Examination, July/August 2021
Pavement Design

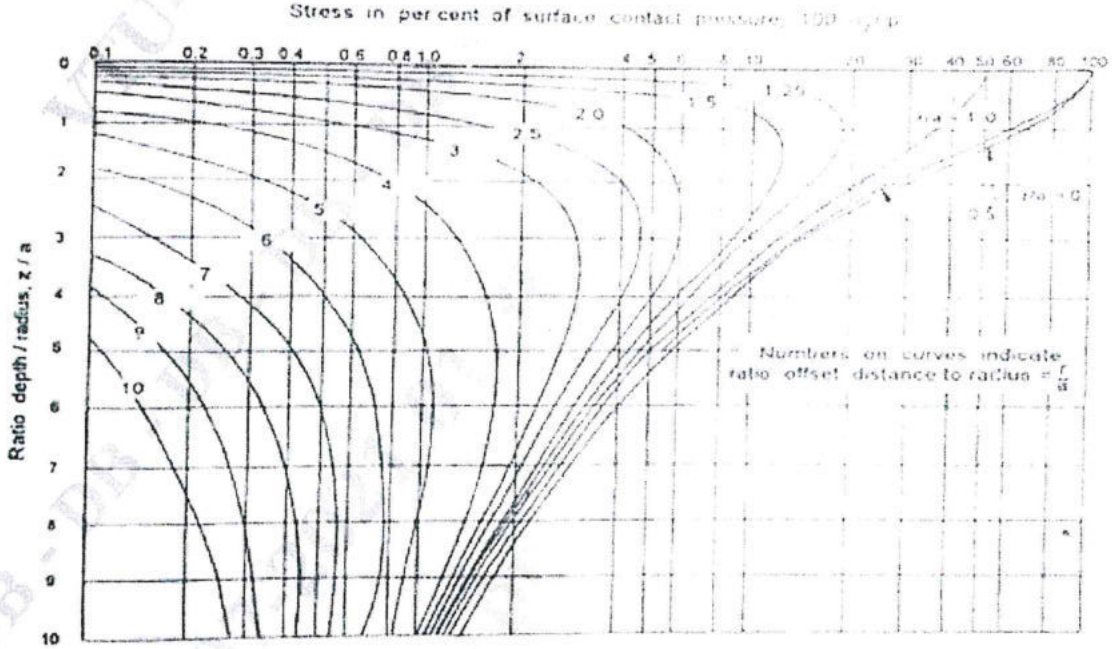
Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Compare the properties of flexible and rigid pavement. **(08 Marks)**

b. Describe the functions of Granular sub base, base and wearing course in the pavement structure. **(08 Marks)**

2 a. A dual wheel load of 100 kN load on each wheel and a contact pressure of 0.7 N/mm^2 is applied on a homogeneous layer with E = 12 N/mm^2. If the centre to centre distance between the wheels is 600 mm determine the stress at a depth of 0.5 m at 4 points at the centre of dual wheels, at a radial distance of 300, 600 and 900 mm from the centre of the dual wheels. Use deflection chart given in Fig. Q2 (a). **(08 Marks)**



Vertical stress distribution chart

Fig. Q2 (a)

b. Distinguish between Boussinesq's and Burmister theory. **(08 Marks)**

3 a. Explain the relationship between the tyre pressure and contact pressure with a help of a graph. **(08 Marks)**

b. Determine the ESWL at depth of 15 cm, 20 cm and 25 cm if the dual wheel load assembly carries 2044 kg load on each axle, the centre to centre spacing between the wheels is 27 cm and the clear distance between the tyre walls is 11 cm. **(08 Marks)**

4 a. Explain the method of designing the pavement by Kansas and Mcleod method. **(08 Marks)**

b. Design the thickness of flexible pavement to be constructed on the subgrade soil with CBR 10%. The commercial vehicle traffic intensity is 700 cvpd, vehicle damage factor is 1.5, rate of growth of commercial traffic is 7.5% and design life of pavement is 15 years. Use IRC 37 : 2001 chart given in Fig. Q4 (b). **(08 Marks)**

CBR 9% & 10%					
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	375	20 PC		225	150
2	425	20 PC	50 BM	225	150
3	450	20 PC	50 BM	250	150
5	475	25 SDBC	50 DBM	250	150
10	540	40 BC	50 DBM	250	200

Pavement design catalogue recommended for traffic range 9-10 MSA as per IRC 37:2001

Fig. Q4 (b)

5 a. List the various types of flexible pavement failure. **(08 Marks)**

b. Explain the Benkalman beam deflection method of conducting test to design overlay thickness of flexible pavement. **(08 Marks)**

6 a. What are the various types of maintenance work that can be done on flexible pavement surface course? **(08 Marks)**

b. Explain the various approaches of flexible pavement evaluation. **(08 Marks)**

7 a. Calculate the stresses at interior, edge and corner of rigid pavement as per Westergaard's equation. Given : Wheel load = 5100 kg, $E = 3 \times 10^5$ kg/cm^2, Pavement thickness = 18 cm, Poisson's ratio = 0.15, K = 6 kg/cm^3 and radius of contact area = 15 cm. **(08 Marks)**

b. Explain the step by step procedure of designing the rigid pavement thickness as per IRC 58 : 2002. **(08 Marks)**

8 a. What are the different types of temperature stresses involved in the rigid pavement? Explain. **(08 Marks)**

b. Design the size and spacing of dowel bars at the expansion joints of a cement concrete pavement of thickness 25 cm with radius of relative stiffness 80 cm, for a design wheel load of 5000 kg. Assume load capacity of dowel system as 40% of the design wheel load. Joint width is 2 cm, permissible shear and flexural stress in dowel bar are 1000 and 1400 kg/cm^2 respectively and permissible bearing stress in CC is 100 kg/cm^2. **(08 Marks)**

9 a. Explain the various types of rigid pavement failures. **(08 Marks)**

b. Draw a neat figure representing all the joints involved in the rigid pavement and explain the concept involved in providing the joints. **(08 Marks)**

10 a. Explain the maintenance measures adopted for the rectification of cracks developed in the cement concrete pavements. **(08 Marks)**

b. Write a note on how to maintain the joints in rigid pavements. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17CV81

Eighth Semester B.E. Degree Examination, July/August 2021
Quantity Surveying and Contracts Management

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 What is an estimate? Explain briefly purpose and different types of estimate (any three). **(20 Marks)**

2 The details of two room building are shown in the Fig.Q2. Estimate quantities and cost of the following items of work:

(i) Earth work excavation for foundation in ordinary soil at Rs.390/m^3
(ii) Bed concrete CC 1:4:8 for foundation at Rs.3600/m^3
(iii) S.S.M for foundation and basement at Rs.2600/m^3
(iv) Burn brick masonry for superstructure in CM 1:6 at Rs.5400/m^3
(v) RCC roof slab M20 at Rs.4800/m^3

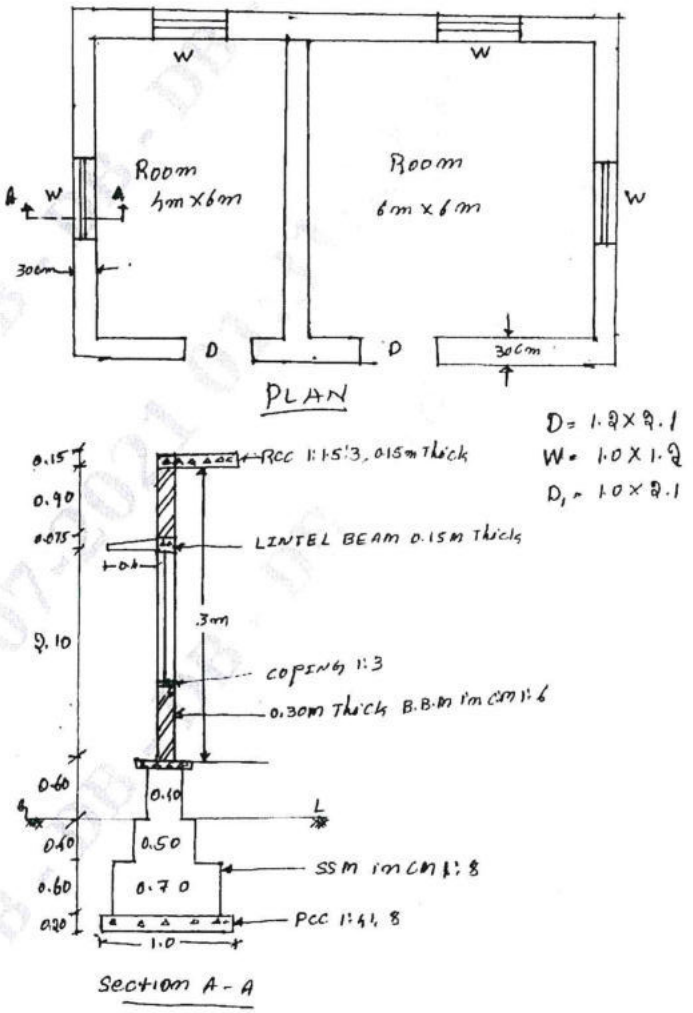


Fig.Q2 **(20 Marks)**

3 The details of septic tank are shown in Fig.Q3. Estimate the quantities of following items and cost.

(i) Earth work excavation at Rs.440/m^3
(ii) P.C.C. 1:3:6 for bed at Rs.4200/m^3
(iii) B.B.M. in CM 1:4 at Rs.4500/m^3
(iv) Plastering in CM 1:4 at Rs.250/m^2

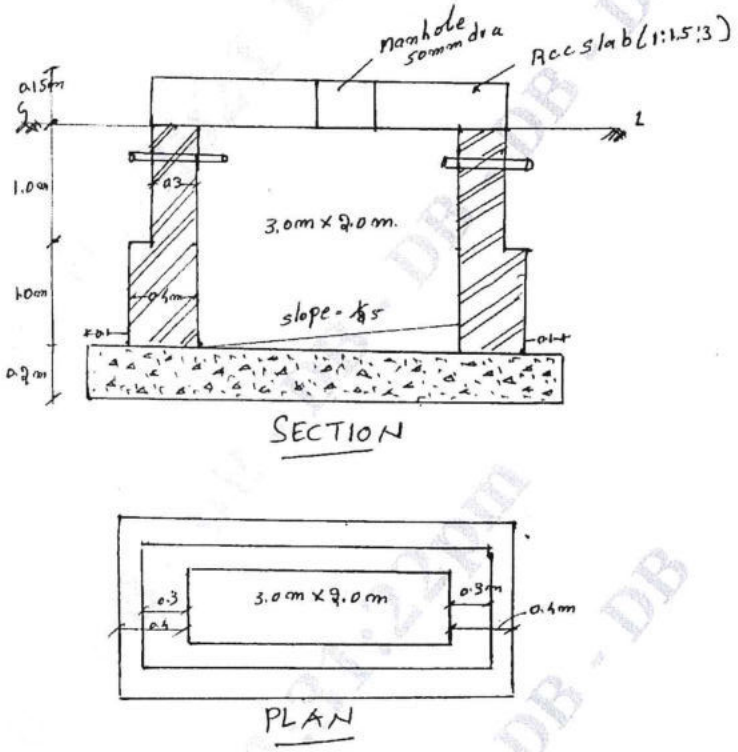


Fig.Q3 **(20 Marks)**

4 Reduced Level (RL) of ground along centre line of a proposed road from chainage 10 to chainage 20 are given below. The formation level at the 10th chainage is 107 and the road and the road is in downward gradient of 1 in 150 upto the chianage 14 and the gradient changes to 1 in 100 downward. Formation width is 10 metre and side slope of banking are 2:1 (H:V). Length of chain is 30 m. Estimate the quantities and cost of earth at the rate the cost of filling is 200/m^3 and cutting Rs.140/m^3.

Chainage	10	11	12	13	14	15	16	17	18	19	20
RL of the ground	105.00	105.60	105.44	105.90	105.42	104.30	105.00	104.10	104.62	104.00	103.3
RL of formation	107.00										
Gradient	Down ward gradient 1 in 150					Down gradient 1 in 100					

(20 Marks)

5 Write detailed specification for following:

(i) Earth work excavation for foundation
(ii) Bed concrete for foundation CC 1:4:8
(iii) Size stone masonry for foundation in CM 1:8
(iv) Burnt brick masonry for super structure in CM 1:6 **(20 Marks)**

6 Analyze rates from first principle for following:
(i) Random rubble masonry for foundation in CM 1:6
(ii) Earth work excavation for foundation
(iii) RCC roof slab CC 1: 1½ : 3 with 1% steel
(iv) Burnt Brick Masonry (BBM) for super structure in CM 1:6. **(20 Marks)**

7 List the types of contract. Briefly explain any three types of contract. **(20 Marks)**

8 Explain briefly for the following:
(i) Administrative approval
(ii) Tender and its process
(iii) Law of contract as per Indian Contact Act 1872.
(iv) Prequalification **(20 Marks)**

9 Explain briefly for the following:
(i) Mobilization and equipment advance
(ii) Security deposit
(iii) Breach of contract
(iv) Suspension of work **(20 Marks)**

10 What is valuation? Explain briefly methods of valuation buildings. **(20 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17CV82

Eighth Semester B.E. Degree Examination, July/August 2021
Design of Prestressed Concrete Elements

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions.*
2. Use of IS-1343 is permitted.

1 a. Distinguish between pretensioning and post-tensioning. **(06 Marks)**

b. List the advantages of PSC over RCC. **(04 Marks)**

c. Explain with sketch Hoyer's long line systems of pre-tensioning. **(10 Marks)**

2 a. Explain the concept of load balancing in prestressed concrete design. **(06 Marks)**

b. A prestressed concrete beam made of T-section has flange (1000mm and 150mm) and web 200mm × 800mm. Beam supports super imposed load of 180kN/m over a simply supported span of 8m. If the prestressing force in the tendon is 6200kN at mid span and is located at a distance of 500mm from soffit, determine the resultant stresses at mid span for the following cases:

i) Prestress + self weight

ii) Prestress + self weight + super imposed load

Take unit weight of concrete = $24kN/m^3$. **(14 Marks)**

3 a. List the different types of losses in pretensioning and post tensioning separately. **(06 Marks)**

b. A prestressed concrete beam 300mm × 600mm is prestressed by tendons of area $800mm^2$ at a constant eccentricity of 100mm with an initial stress of $1050N/mm^2$. Span of the beam is 10.5m. With the following additional data, calculate losses for both pre and post-tensioning cases:

ES = $210kN/mm^2$

EC = $35kN/mm^2$

Anchorage slip = 1.5mm

K = 0.0015m

Ultimate keep strain = 40×10^{-6} per $1N/mm^2$ stress for pretensioning and 20×10^{-6} per $1N/mm^2$ for post tensioning

Shrinkage strain = 300×10^{-6} for pretensioning

= 200×10^{-6} for post-tensioning

Relaxation steel = 2.5% **(14 Marks)**

4 a. What are the factors influencing deflections of PSC beams? Indicate how long term deflection is calculated? **(07 Marks)**

b. A concrete beam having a rectangular section 150mm × 300mm is prestressed by a parabolic cable at an eccentricity of 75mm at mid span towards bottom soffit and at an eccentricity of 25mm towards top at support sections. The effective prestressing force is 350kN. The beam supports a concentrated live load of 20kN at centre of span in addition to the self weight with a span 8m. Find the short term deflection at the centre of span under prestress, self weight, and live load. Find also the long term deflection if the loss ratio is 0.8 and the creep coefficient is 1.6. Take $E_C = 38kN/mm^2$.

(13 Marks)

5 a. Discuss the IS code method of determining the ultimate moment of resistance of rectangular and flanged sections PSC members. **(08 Marks)**

b. A post-tensioned bonded prestressed concrete beam of T-section has a flange width of 1500mm and thickness of flange is 200mm. Thickness of the rib is 300mm. The area of high tensile steel is $5000mm^2$, located at an effective depth of 1800mm. If the characteristic strength of concrete and steel are $40N/mm^2$ and $1600N/mm^2$ respectively. Calculate the flexural strength of T-section. **(12 Marks)**

6 Design a pretensioned roof purlin to suit the data given below:
Effective span = 6m, udl = 5kN/m, $f_{ck} = 50N/mm^2$, loss ratio = 0.8 permissible stresses at transfer are $\sigma_{ct} = 15N/mm^2$, $\sigma_{tt} = -1.0N/mm^2$. At service load permissible stresses are, $\sigma_{cw} = 17N/mm^2$, $\sigma tw = 0$, 7mm high tensile steel wires having an ultimate strength $f_{pu} = 1600N/mm^2$ are available for use. **(20 Marks)**

7 a. Explain the mechanism of shear failure in PSC beam. **(04 Marks)**

b. A concrete beam of rectangular section 200mm wide and 650mm deep is prestressed by a parabolic cable located at an eccentricity of 120mm at mid span and zero at the supports. If the beam has a span of 12m and carries a udl of 4.5kN/m. Find the effective force necessary in the cable for zero shear stress at the support section. For this condition calculate the principal stresses. The density of concrete is $24kN/m^3$. **(08 Marks)**

c. The support section of a PSC beam (150 × 300mm) is to resist a shear of 100kN. The prestress at centroidal axis is $5N/mm^2$, fck = $40N/mm^2$. The cover to tension reinforcement is 45mm. Check the section for shear and design suitable shear reinforcement, ft = $1.5N/mm^2$. **(08 Marks)**

8 A post tensioned beam of size 400mm width and 600m depth is subjected to the following ultimate load conditions at service loads:
M = 350kN-m
T = 100kN-m
V = 100kN
If the area of prestressing tendons is $70mm^2$ and effective prestressing force at service load condition is 800kN at an eccentricity of 200mm using provisions of IS:1343, design suitable transverse reinforcement. Take
$f_{ck} = 40N/mm^2$
$f_y = 415N/mm^2$
$f_{pu} = 1600N/mm^2$ and cover = 50mm. **(20 Marks)**

9 a. What is meant by composite construction in PSC? What are the advantages of composite construction? **(08 Marks)**

b. The precast prestressed unit has dimension 120mm × 200mm while cast-in-situ slab has 400mm × 40mm. The effective span is 6m and is prestressed with a force of 250kN with its centroid coinciding with bottom kern point. Determine the final stresses developed, if live load on slab is $10kN/m^2$. Assume loss of prestress as 15 percent and modular ratio between pre cast and cast in concrete same. The beam was not propped while casting slab. **(12 Marks)**

10 A composite beam is made up of a precast rib of size 120mm × 200mm and a cast-in-situ slab of size 400mm × 40mm. It was prestressed with a force of 250kN with straight cables at an eccentricity of 35mm. Determine the deflection of the beam, if it is unsupported at the time of casting slab. Assume 15% loss.
Given : span = 6m,
Live load = 4kN/m
Modulus of elasticity for precast and cast-in-situ concrete = $30kN/mm^2$. **(20 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

17CV833

Eighth Semester B.E. Degree Examination, July/August 2021
Pavement Design

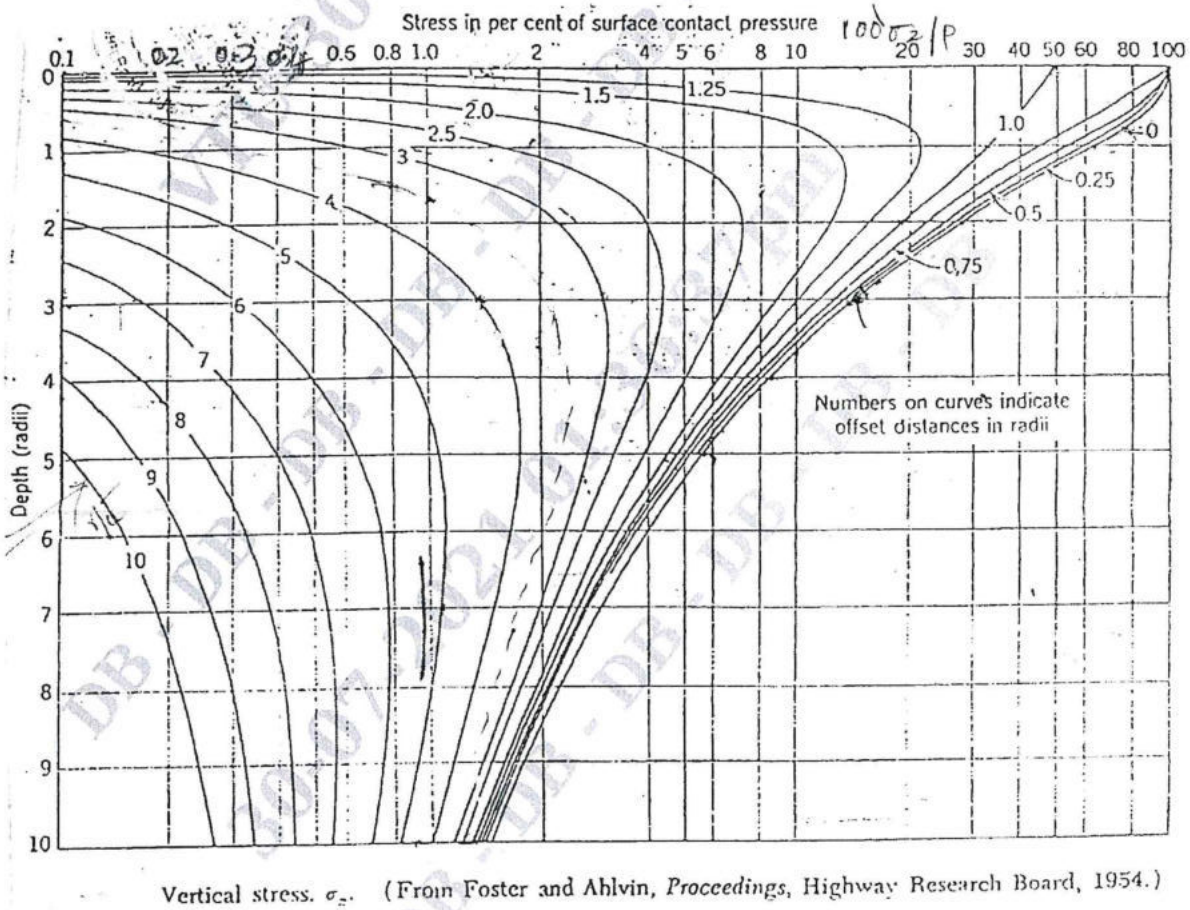
Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Explain the desirable characteristics of the pavement. **(06 Marks)**

b. For a wheel load of 40 kN and a tyre pressure of 0.5 MN/mm^2. If the value of E of the pavement and subgrade is assumed to be uniformly equal to 20 MN/mm^2. Compute deflection at the surface of the pavement. **(07 Marks)**

c. Determine the vertical stress under to the centre of the load at a depth of 45 cm from the surface for a circular load of radius 15 cm with uniform contact pressure of 7.0 kg/cm^2 is applied on the surface of a homogeneous elastic mass. **(07 Marks)**



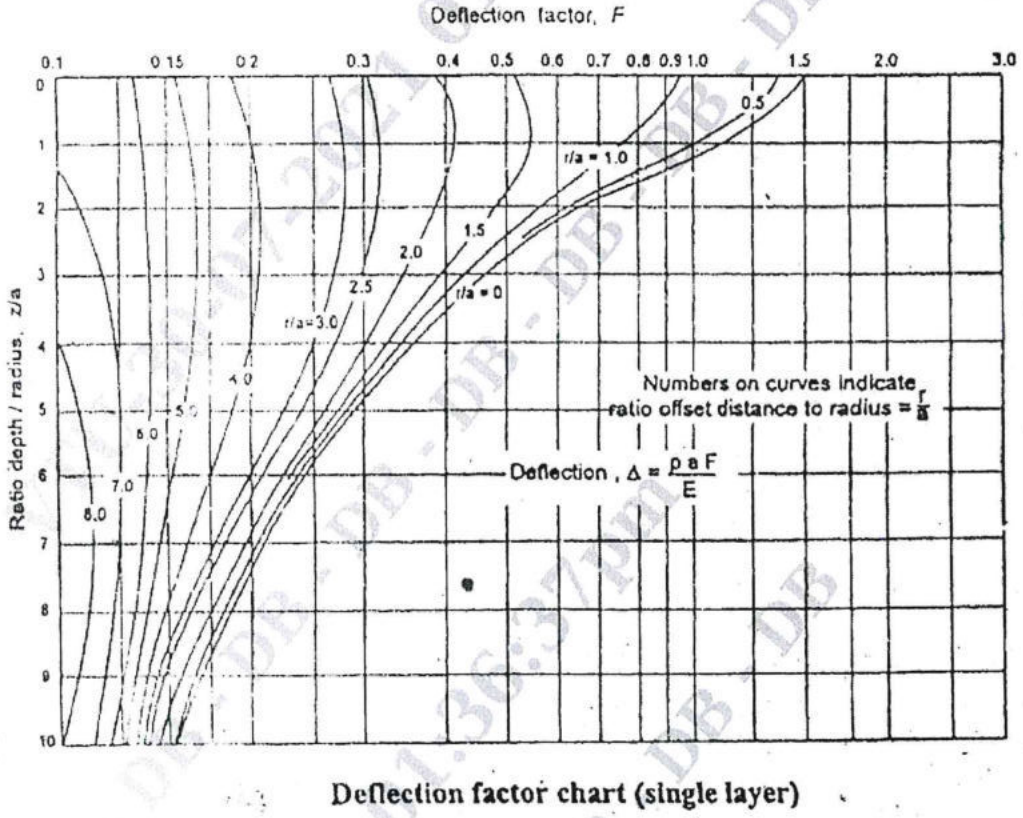
Vertical stress. σ_z. (From Foster and Ahlvin, *Proceedings*, Highway Research Board, 1954.)

Fig. Q1 (c)

2 a. Compare flexible pavement and rigid pavement. **(05 Marks)**

b. Draw a neat sketch of cross section of the flexible pavement and explain function of each layer. **(07 Marks)**

c. Determine the pavement thickness required to limit max deflection of 0.90 cm under a wheel load of 5000 kg at a contact pressure 6 kg/cm^2 and the ε-value of sub grade soil is 50 kg/cm. **(08 Marks)**



Deflection factor chart (single layer)

Fig. Q2 (c)

3 a. Calculate the ESWL of a dual wheel assembly carrying 2400 kg each for pavement for pavement thickness of 20 cm, 25 cm and 30 cm. The centre to centre tyre spacing is 300 mm and the distance between the walls is 120 mm. **(10 Marks)**

b. Design the pavement section by triaxial tent (Kansas method) using the following data
Wheel load = 4100 kg ;
Radius of contact area = 15 cm
Traffic coefficient x = 1.5 ;
Rainfall coefficient y = 0.9
Design deflection Δ = 0.25 cm;
E-value of subgrade soil E_S = 100 kg/cm^2 ;
E-value of base course material, E_b = 400 kg/cm^2 ;
E-value of 7.5 cm thick Bituminous concrete surface course = 1000 kg/cm^2. **(10 Marks)**

4 a. Design the pavement for a two way road on a soil of CBR 4% for an initial traffic of 1200 CV/day. The period of construction is 5 years and the design life is 15 years after opening to traffic. The vehicle damage factor is 2.5. The rate of growth traffic is 8% per annum. Show with a sketch to composition of designed pavement, use chart. **(10 Marks)**

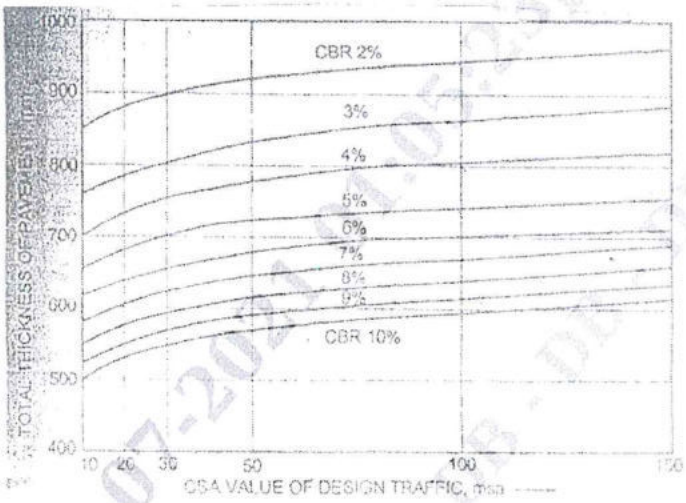


Fig. 7.15 CBR design chart for determination of total pavement thickness for traffic with CSA of 10 to 150 msa

Table 7.4, Pavement design with recommended component layers for cumulative traffic range 10 to 150 msa

CBR, %	CSA, msa	Total pavement thickness, mm	Granular sub-base, mm	Granular base, mm	Dense bituminous Macadam binder course, mm	Bituminous concrete surface course, mm
3	10	760	380	250	90	40
	20	790			120	40
	30	810			140	40
	50	830			160	40
	100	860			180	50
	150	890			210	50
4	10	700	330	250	80	40
	20	730			110	40
	30	750			130	40
	50	780			160	40
	100	800			170	50
	150	820			190	50
6	10	615	260	250	65	40
	20	640			90	40
	30	655			105	40
	50	675			125	40
	100	700			140	50
	150	720			160	50
8	10	550	200	250	60	40
	20	575			85	40
	30	590			100	40
	50	610			120	40
	100	640			140	50
	150	660			160	50
10	10	540	200	250	50	40
	20	565			75	40
	30	580			90	40
	50	600			110	40
	100	630			130	50
	150	650			150	50

Fig. Q4 (a)

b. Calculate the design repetitions for 20 years period for various wheel load equivalent to 2268 kg of wheel load using the following data on a four lane road. The mixed traffic in both direction is 2100 Veh/day.

Load kg	2268	2722	3175	4082	4536	4990	5443
% of total traffic	25	12	9	4	3	2	1

Assume (ELF) for different wheel load.

Wheel load	22.68	27.22	31.72	40.82	45.36	49.90	54.43
ELF	1	2	4	16	32	64	128

(10 Marks)

5 a. List the general causes of flexible pavement failures and analysis the failure with respect to sub base and base course. **(07 Marks)**

b. Explain with details the various maintenance of operations. **(06 Marks)**

c. Explain maintenance of Bituminous surfaces. **(07 Marks)**

6 a. Justify the evaluation of flexible pavement by present serviceability index method. **(06 Marks)**

b. The BBD data were analysed and modified characteristics deflection value after applying corrections for pavement temperature and subgrade moisture was found to be 2.20 mm, the design traffic in terms of CSA is found to be 20 mSa. Using overlay chart determine the thickness of overlay. **(07 Marks)**

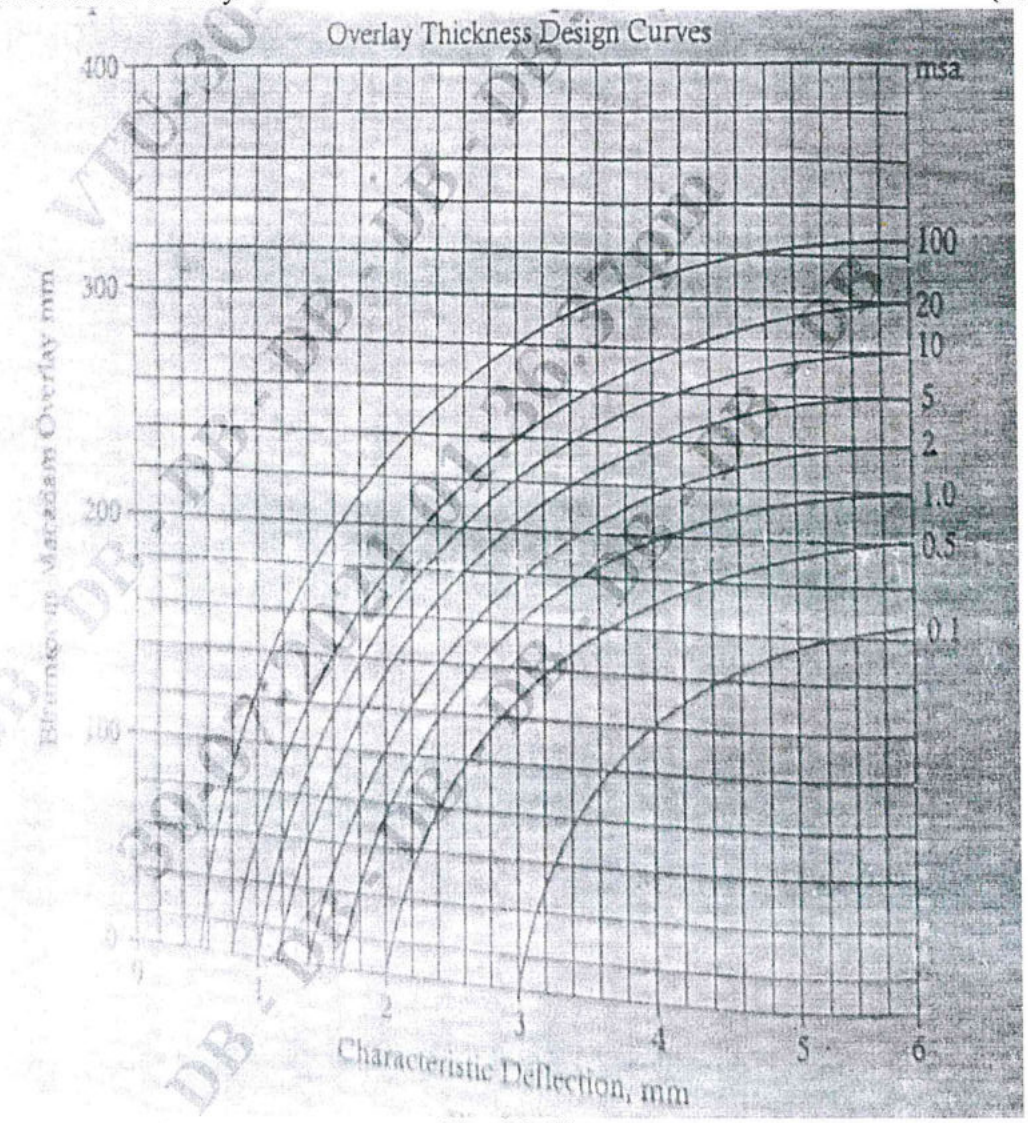


Fig. Q6 (b)

c. List and explain general types of distress in bituminous pavement. **(07 Marks)**

7 a. Determine the warping stress of interior, edge and corner regions in a 28 cm thick cement concrete pavement with transverse joints at 5.5 mt interval and longitudinal joints at 3.5 mt intervals. Modulus of subgrade reaction is 5.0 kg/cm^2. Temperature deterential is 0.80°C per cm slab thickness. If the tyre pressure is 5.0 kg/cm^2 for a wheel load of 51000 kg. Elastic modulus of pavement interval/CC/ E = 3×10^5 kg/cm^2, Poisson's ratio = 0.15. Assume suitable required. **(10 Marks)**

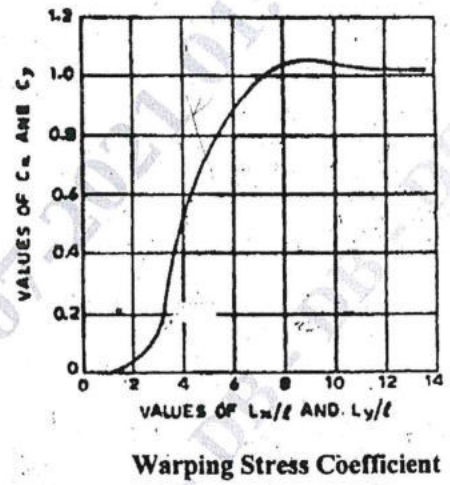


Fig. Q7 (a)

b. Write the step by step procedure for the design of concrete pavements as recommended by IRC-58-2002. **(10 Marks)**

8 a. Design the dowel bars for the following data design of wheel load. 98 Percentile angle load is 8000 kg. Slab thickness is 33 cm. Joint width 2 cm, radius of relative stiffness is 103.53 cm, compressive strength of concrete at 28 days is 400 kg/cm^2. Elastic modulus of concrete 0.3×10^5 kg/cm^2 and Poisson's ratio is 0.15. **(10 Marks)**

b. Explain the significance of relative stiffness and radius of resisting section. **(10 Marks)**

9 a. Evaluate the various design factors to be considered in Air port pavement. **(10 Marks)**

b. With the help of neat sketches, explain "mud pumping" in concrete pavements. **(10 Marks)**

10 a. Explain with neat sketches the various types of joints in C.C pavements and its functions. **(10 Marks)**

b. Explain the various types of failures in cement concrete pavements and their causes. **(10 Marks)**

* * * * *