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10CV71

Seventh Semester B.E. Degree Examination, June/July 2015
Environmental Engineering - II

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions.***
2. ***Relevant charts are permitted.***

1 a. Explain the need for good sanitation. Hence, describe types of sewerage system and their suitability. **(06 Marks)**

b. Explain factors affecting DWF and the effects of flow variations on the design of sewerage systems. **(07 Marks)**

c. A certain district of a city has a projected population of 50000 residing over an area of 40Ha. Find the design of discharge for the sewer line, for the following data :
i) Rate of water supply = 200 ℓpcd ii) Average impermeability factor for the area = 0.3 iii) Time of concentration = 50 minutes. The sewer line is to be designed for a flow equivalent to the WWF plus twice the DWF. Take sewage generated as equal to 75% of water supplied. Use the formula :

$R_i = \frac{25.4a}{t+b}$. Comment on the result. **(07 Marks)**

2 a. Explain the effect of flow variations on velocity of flow in sewers. **(06 Marks)**

b. Explain i) self cleansing velocity ii) Non – scouring velocity. **(05 Marks)**

c. A 600mm diameter sewer is required to flow at 0.4 depth on a grade ensuring a degree of self cleansing equivalent to that obtained at full depth at a velocity of 850mm/s. Find the required grade, associated velocities and rates of discharge at full depth and 0.4 depth. Take $n = 0.015$ for all depth of flow. [Given $\frac{a}{A} = 0.374$; $\frac{r}{R} = 0.857$]. **(09 Marks)**

3 a. Explain the need for providing sewer appurtenances in sewerage system. Hence name common sewer appurtenances. **(04 Marks)**

b. What are inlets? Draw the locations and section of inlet and explain. **(06 Marks)**

c. What is Manholes? Explain the need of manhole. Draw neat sketches of deep manhole. **(10 Marks)**

4 a. Differentiate between fresh sewage , stale sewage and septic sewage. **(03 Marks)**

b. What is first stage BOD? Derive the equation for 1st stage BOD, with a neat sketch. **(05 Marks)**

c. Explain COD and its relation with BOD. **(04 Marks)**

d. What is Treatability Index? What is the use of treatability index? **(08 Marks)**

5 a. Explain various factors that affect self purifications process of stream. **(07 Marks)**

b. Explain waste water disposal into sea. **(05 Marks)**

c. $100 m^3/s$ of a city sewage is discharged in a river which is fully saturated with oxygen and flows at a minimum rate of 1250 m^3/s, with a minimum velocity of 0.15m/s. If the 5 – day BOD of the sewage is 260 mg/ℓt, find where the critical DO will occur in the river. Take $K_D = 0.11 d^{-1}$, f = 4.0. Also ultimate BOD is 125% of 5-d BOD of the mixture of sewage and river water. DO saturated for river water = 9.17mg/ℓt. **(08 Marks)**

6 a. Explain the importance of providing rocks and screens in a waste – water treatment plant. Draw a neat sketch of a bar – screen and explain the loss of head through the screen. **(10 Marks)**

b. Write a note on grit – chambers. **(05 Marks)**

c. What are skimming tanks? Explain with a neat sketch. **(05 Marks)**

7 a. Explain the biological treatment techniques for treating waste - water. **(06 Marks)**

b. What are HRTF's? Explain importance of recirculations and its effect on the efficiency of HRTF's. **(06 Marks)**

c. The MLSS concentration in an aeration tank is 2000mg/ℓt and the sludge volume after 30 minutes of settling in a 1000mℓ cylinder is 176mℓ. Calculate :
i) SVI ii) SDI iii) Required return sludge ratio and iv) SS concentration in the recirculated sludge. **(08 Marks)**

8 a. What are stabilization ponds? Explain the algae – bacteria symbiosis in an oxidation pond with a neat sketch. **(06 Marks)**

b. Explain the stages in anaerobic sludge digestion. **(06 Marks)**

c. Draw a neat sketch of septic tank with soak pit. Write the design criteria required for septic tank. **(08 Marks)**

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10CV72

Seventh Semester B.E. Degree Examination, June/July 2015
Design of Steel Structures

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. IS800-2007 and steel tables permitted.

PART – A

1 a. Briefly explain the failure criteria for steel. **(05 Marks)**

b. Mention the advantages (any five) and disadvantages (any three) of steel members. **(05 Marks)**

c. Explain briefly:
i) Partial safety factors for loads
ii) Characteristic strength of steel
iii) Plastic, compact and semicompact members. **(10 Marks)**

2 a. Mention any four advantages and disadvantages of Bolted connections. **(04 Marks)**

b. Two plates of 16mm thickness have been connected in a lap joint using HSFG bolts. Design the joint so as to transmit a pull equal to the full strength of plate. Adopt 16mm diameter bolts. Assume edge distance of 30mm, pitch = 60mm. **(08 Marks)**

c. Determine nominal shear capacity, design shear strength, nominal bearing strength and design strength in bearing for M16, property class 8.8 bolts assuming bolt threads outside the shear plane. Bolts are connected to 12mm thick plates. Assume end distance of bolt = 30mm, pitch = 80mm, f_u = 410 MPa, A_{sb} = 201mm^2. **(08 Marks)**

3 a. Determine size of weld, pull transmitted, length of weld and tensile strength of plate (smaller width) for the plates shown in Fig.Q.3(a) if the plates are of 10mm thick each. Assume suitable partial safety factor and yield stress for weld and steel plates. **(10 Marks)**

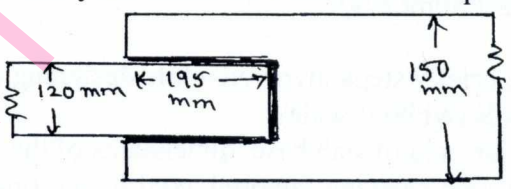

Fig.Q.3(a)

b. Determine the suitable weld size for the connection shown in Fig.Q.3(b). **(10 Marks)**

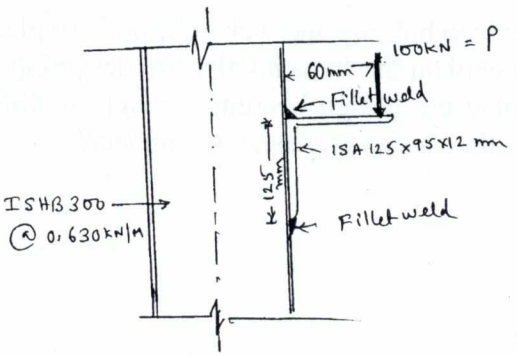

Fig.Q.3(b)

4 a. Define plastic hinge, collapse load, shape factor, a mechanism and plastic moment. **(05 Marks)**

b. State lower and upper bound theorem. **(05 Marks)**

c. Determine :

i) Number of possible plastic hinges

ii) Number of independent mechanisms and

iii) Collapse load for the beam.

Shown in Fig.Q.4(c) **(10 Marks)**

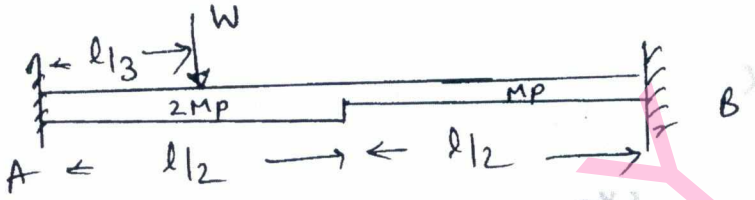

Fig.Q.4(c)

PART – B

5 a. Mention the steps followed for designing a Tie member. **(05 Marks)**

b. Design a single angle to carry a tension of 100kN. Adopt M20, Grade 'C', property class 4.6 bolts. Assume yield and ultimate strengths of the steel as 250MPa and 410MPa respectively. Also, check for rupture and block shear. Assume A_{sb} for M_{20} holt = 314 mm^2, pitch = 60mm, edge distance = 40mm. **(15 Marks)**

6 a. Determine the design load carrying capacity of a single angle (discontinuous) ISA 50 × 50 × 5 used as a compression member in a roof truss connected to a 10mm gusset by two bolts. The center to center distance between and connections is 1.50mt. Assume f_y = 250MPa. **(10 Marks)**

b. Determine the load carrying capacity of two angles ISA 70 × 70 × 6mm connected to both sides of gusset using two bolts. Sketch the details. Adopt 8mm gusset plate. Length of the angle be 2.50mt. **(10 Marks)**

7 a. Explain briefly steps involved while designing a slab base and a Gusseted base. Also, sketch the details (without scale). **(10 Marks)**

b. Determine area of slab base, dimensions of the slab base and thickness of the base plate for a steel column carrying factored axial load (compression) of 1000kN. Pedestal is of concrete M20. Adopt f_y = 250MPa for steel. **(10 Marks)**

8 a. What is web bukling and web crippling? Explain briefly with sketches. **(05 Marks)**

b. Briefly explain the steps involved in designing a steel beam as per IS800 – 2007. **(05 Marks)**

c. Determine the design bending strength of ISMB 400 @ 61.6 kg/m having effective span 10m. Is the section is plastic or compact? **(10 Marks)**

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10CV/CT73

Seventh Semester B.E. Degree Examination, June/July 2015
Estimation and Valuation

Time: 3 hrs. Max. Marks:100

Note: ***Answer Q.No.1 and any FOUR by selecting TWO from Part-B and TWO from Part-C.***

PART – A

1 The details of a residential building as shown Fig.Q.1. Work out the quantities and cost of the following items of work.
- i) Earth work in excavation for foundation at Rs.125/m^3.
- ii) Plain cement concrete bed 1:4:8 at Rs.3900/m^3.
- iii) Size stone masonary in CM 1:6 for foundation and basement at Rs.2900/m^3.
- iv) First class brick work in super structure in CM 1:5 at Rs.4000/m^3.
- v) RCC roof slab with cement concrete M20 at RS.5800/m^3. **(40 Marks)**

PART – B

2 a. What is an estimate? Explain the necessity of estimate. **(07 Marks)**

b. Explain different types of estimate of buildings. **(08 Marks)**

3 The details of an RCC slab culvert is as shown in Fig.Q.3 Work out the quantities and cost of the following item of works:
- i) Earth work for the foundation.
- ii) First class brick work for the super structure with CM 1:4.
- iii) RCC work with C.C 1:2:4. **(15 Marks)**

4 Write the detail specifications of the following item of works (any three):
- i) Size stone masonry in foundation in CM 1:6.
- ii) 12mm plastering for walls with CM 1:3.
- iii) RCC 1:2:4 for roof slab, beams.
- iv) Painting on wood works. **(15 Marks)**

PART – C

5 Analyze the rate per unit of work from the first principle. Assume local rates:
- i) Cement concrete in foundation in P.C.C 1:4:8.
- ii) Burnt brick masonry in super structure with CM 1:5.
- iii) 12mm thick plastering in CM 1:3 for walls. **(15 Marks)**

6 Estimate the quantity of earth work for a road of formation width 10m with the following data by mid sectional area method and trapezoidal formula method. Side slope in banking 1:1. **(15 Marks)**

Chainage (m)	0	40	80	120	160
Ground level (m)	101.20	101.50	101.80	102.00	101.80
Formation level (m)	102.00	← Rising gradient → 1 in 200			

7 a. What is contract? Explain different types of contract. **(05 Marks)**

b. Define the terms: i) Tender; ii) Earnest money deposit; iii) Security deposit; iv) Nominal muster roll. **(05 Marks)**

c. Explain the terms sinking fund and depreciation. Explain any one methods of determination of depreciation. **(05 Marks)**

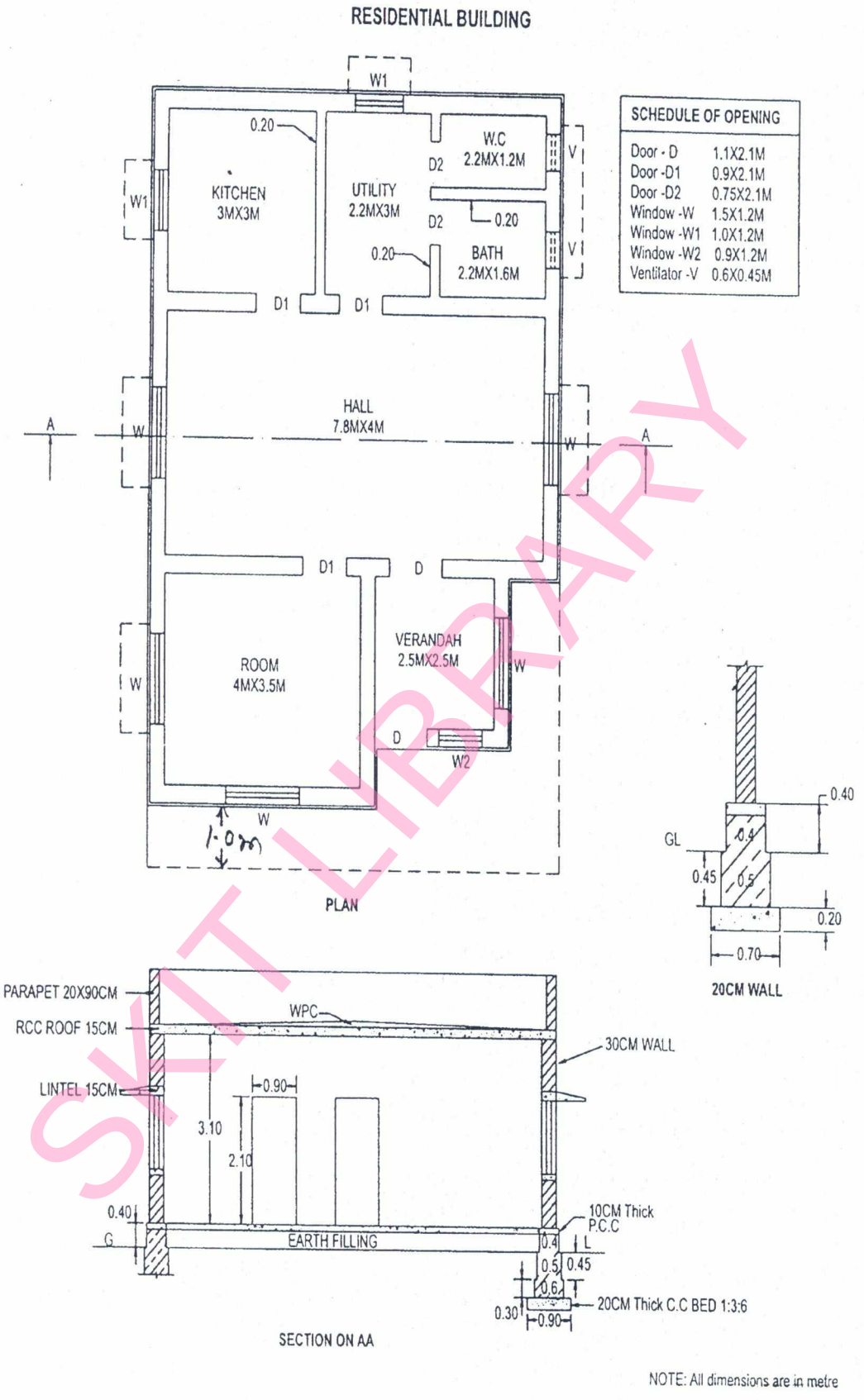

Fig.Q.1

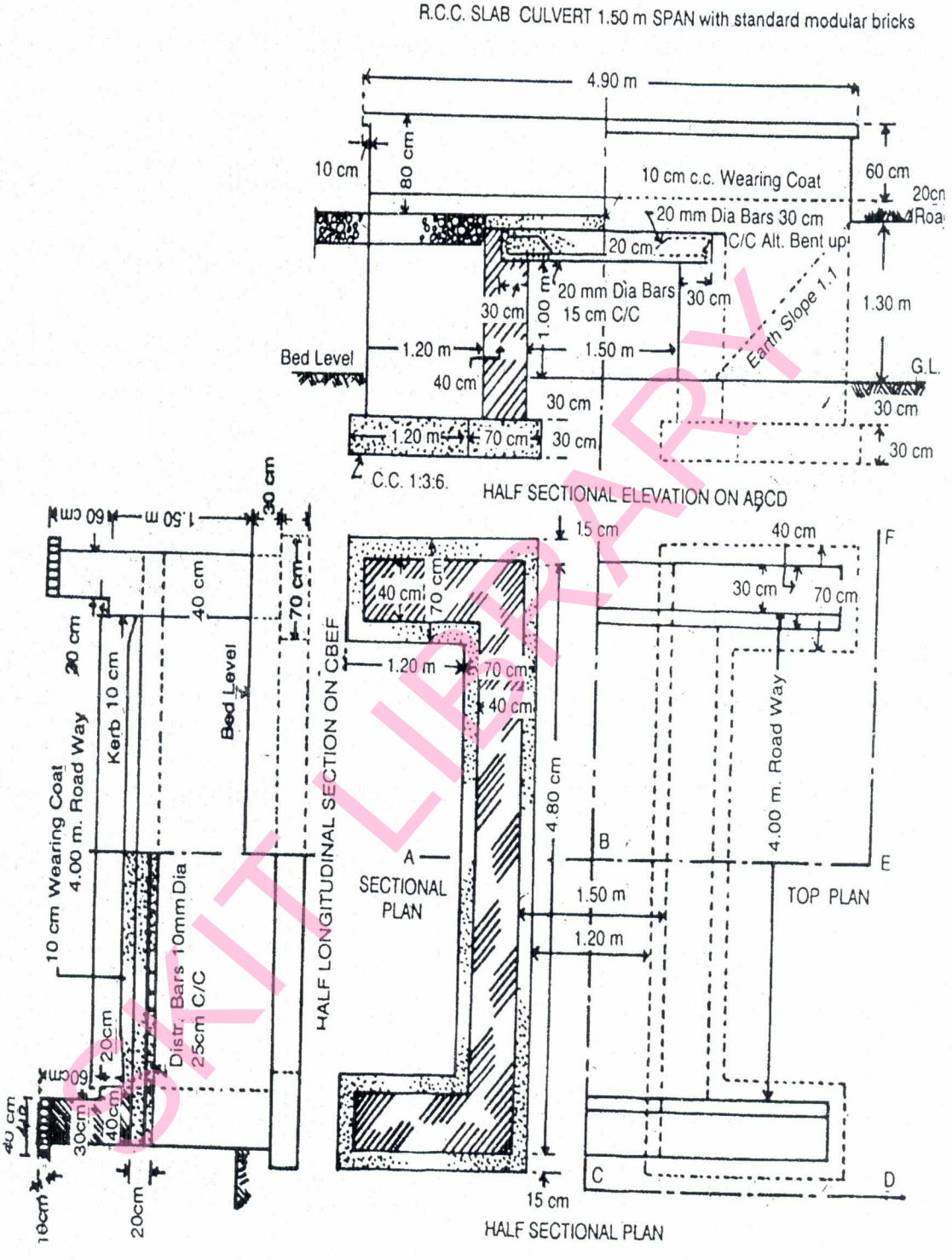
R.C.C. SLAB CULVERT 1.50 m SPAN with standard modular bricks
4.90 m
10 cm
80 cm
10 cm c.c. Wearing Coat
60 cm
20 mm Dia Bars 30 cm C/C Alt. Bent up
20 cm
20 mm Dia Bars 15 cm C/C
30 cm
1.00 m
30 cm
1.30 m
Earth Slope 1:1
Bed Level
1.20 m
1.50 m
G.L.
40 cm
30 cm
30 cm
1.20 m
70 cm
30 cm
30 cm
C.C. 1:3:6.
HALF SECTIONAL ELEVATION ON ABCD
30 cm
1.50 m
60 cm
40 cm
70 cm
20 cm
10 cm Wearing Coat
4.00 m. Road Way
Kerb 10 cm
Bed Level
Distr. Bars 10mm Dia 25cm C/C
20cm
60cm
30cm
40cm
40 cm
20cm
HALF LONGITUDINAL SECTION ON CBEF
15 cm
40 cm
70 cm
40 cm
70 cm
1.20 m
70 cm
40 cm
4.80 cm
A
SECTIONAL PLAN
B
1.50 m
1.20 m
C
15 cm
F
40 cm
30 cm
70 cm
4.00 m. Road Way
E
TOP PLAN
D
HALF SECTIONAL PLAN

Fig.Q.3

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10CV74

Seventh Semester B.E. Degree Examination, June/July 2015
Design of Pre-Stressed Concrete Structures

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Use of Is : 1343 – 1980 is permitted.
3. Missing data, if any, may be suitably assumed.

PART – A

1 a. Distinguish between the following terms :
i) Uniaxial and biaxial pre-stressing
ii) Concentric and eccentric pre-stressing. **(06 Marks)**

b. What are the factors influencing the creep and shrinkage of concrete. **(06 Marks)**

c. Brief the Magnel Blaton system of post – tensioning with a neat sketch. **(08 Marks)**

2 a. A simply supported pre-stressed concrete beam 250 mm wide by 500 mm deep of effective span 9 m carries a distributed load of intensity 6 kN/m (including self weight). The beam is pre-stressed by a straight tendon carrying a force of 200 kN located 100 mm below the centroidal axis of the beam. Determine the location of the thrust line in the beam and plot its position at quarter, central and support sections. **(08 Marks)**

b. A concrete beam, 120 mm wide and 300 mm deep is pre-stressed by a straight cable carrying an effective force of 180 kN at an eccentricity of 50 mm. The beam spanning over 6 m supports a total udl of 4 kN m which includes the self weight of the beam. The initial stress in the tendons is 1000 N/mm^2. Determine the percentage of stress in the tendons due to the loading on the beam. $E_s = 210\ kN/mm^2$; $E_c = 35\ kN/mm^2$. **(12 Marks)**

3 a. List the various losses of pre-stress in PSC beams and write the equations used to determine them. **(06 Marks)**

b. A pretensioned beam, 200 mm wide and 300 mm deep is pre-stressed by 10 wires of 7 mm diameter initially stressed to 1200 N/mm^2 with their centriods located 100 mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. If the concrete undergoes a further shortening due to creep and shrinkage while there is relaxation of five percent of steel stress, estimate the final percentage loss of stress in the wires using the Indian standard code of IS : 1343 – 1980 regulations. Take $E_s = 210\ kN/mm^2$ $\phi = 1.6$ residual shrinkage strain $= 3 \times 10^{-4}$ $f_{ck} = 42\ N/mm^2$. **(14 Marks)**

4 a. Using Mohr's theorem, obtain an expression for central deflation in a PSC beam due to pre-stress produced by a parabolic cable with eccentricities e_2 above the centroidal axis at supports and eccentricity e_1 below the centroidal axis at midspan. **(06 Marks)**

b. A post tensioned pre-stressed concrete beam of span 8 m with a rectangular section 300 mm wide by 400 mm deep is pre-stressed by a calbe containing initial force of 1500 kN. If the beam supports a live load of 20 kN/m excluding its selfweight, compute the initial deflection due to pre-stress, selfweight and live loads for the following cases :
i) The cable profile is straight with a constant eccentricity of 100 mm
ii) The cable profile is parabolic with a dip of 100 mm at midspan and concentric at supports. Assume the modulus of elasticity of concrete as 36 kN/mm^2. **(14 Marks)**

PART – B

5 a. Explain with sketches, the method of estimating the ultimate flexural strength of flanged pre-stressed concrete sections according to IS : 1343 code specifications. **(06 Marks)**

b. A post tensioned bridge girder with unbounded tendons is of box section of overall dimensions 1200 mm wide by 1800 mm deep, with wall thickness of 150 mm. The high tensile steel has an area of 4000 mm^2 and located at an effective depth of 1600 mm and pre-stress in steel after all losses is 1000 N/mm^2 and the effective span of the girder is 24 m. If f_{ck}= 40 N/mm^2 and f_p = 1600 N/mm^2, estimate the ultimate flexural strength of the section. **(14 Marks)**

6 a. A concrete beam having rectangular section 200 mm wide, 400 mm deep is pre-stressed by a parabolic cable having an eccentricity 120 mm at the centre of span reducing to zero at the supports. The span of the beam is 10 m. The beam supports a live load of 2.5 kN/m. Determine the effective force in the cable to balance the dead and live loads on the beam. Estimate the principal stresses at the support section and take D_C = 24 kN/m^3. **(10 Marks)**

b. A rectangular section having a width of 500 mm and 800 mm deep. The beam spanning over 16 m is pre-stressed using a cable carrying an effective force of 2000 kN/ The cable is parabolic with an eccentricity of 300 mm at centre of span and zero at supports. Estimate the ultimate shear resistance at the support section. Also evaluate the maximum permissible distributed working load on the beam assuming a load factor of 2 and characteristic compressive strength of concrete as 40 N/mm^2 and loss factor as 0.8. **(10 Marks)**

7 a. Explain the process of transfer of pre-stress in pretensioned members. **(08 Marks)**

b. Briefly discuss the stress distribution in the end block of post tensioned members. **(07 Marks)**

c. Explain end zone reinforcements. **(05 Marks)**

8 Determine the minimum depth of 300 mm wide rectangular beam and the corresponding pre-stressing force and corresponding eccentricity to resist a moment of 360 kNm assuming 10% losses and limiting the tensile and compressive stresses to 1.5 MPa and 18 MPa respectively. Take D_C = 24 kN/m^3. The span being 12 m. **(20 Marks)**

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10CV755

Seventh Semester B.E. Degree Examination, June/July 2015
Highway Geometric Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Mention certain basic design controls and criteria which govern the geometric features of a highway and explain any two of them. **(10 Marks)**

b. Enumerate the concept of PCU in mixed traffic flow on highways. Give PCU values for different classes of vehicles for urban roads. **(06 Marks)**

c. Define capacity and write the theoretical formula to calculate capacity. **(04 Marks)**

2 a. Write short notes on : i) service roads ii) drive ways iii) right of way. **(06 Marks)**

b. What is camber? State the objects of providing camber. Give IRC values for different types of roads in heavy and light rainfall areas. **(06 Marks)**

c. Mention the factors affecting sleid resistance. **(04 Marks)**

d. In a district where the rainfall is heavy major district road of WBM pavement 3.8 m wide and a state highway of bituminous concrete pavement 7.0 m wide are to be constructed, what should be the height of the crown with respect to the edges in these two cases? **(04 Marks)**

3 a. What is PIEV theory? Explain. **(06 Marks)**

b. Mention the factors on which the minimum over taking sight distance required for the safe overtaking. **(04 Marks)**

c. The speed of overtaking and overtaken vehicles are 70 and 40 kmph respectively on a two way traffic road. If the acceleration of overtaking vehicle is 0.99 m/sec^2 :
   i) Calculate safe overtaking sight distance
   ii) Mention the minimum length of overtaking zone and show the positions of the sign posts. **(10 Marks)**

4 a. Write note on mechanical widening and psychological widening. **(06 Marks)**

b. What is transition curve? Mention the different types? **(04 Marks)**

c. Calculate super elevation to be provided for a horizontal curve with radius of 400 m for design speed of 100 kmph in plain terrain. Comment in the results. What is the co-efficient of lateral direction mobilized if super elevation is restricted to 0.07. **(06 Marks)**

d. Calculate the values of ruling minimum and absolute minimum radius of horizontal curve of a nation highway in plan terrain. Assume ruling design speed and minimum design speed values as 100 and 80 kmph respectively. Take e = 0.07 and f = 0.15. **(04 Marks)**

PART – B

5 a. Explain the following with IRC specification : i) Ruling gradient ii) Minimum gradient iii) Exceptional gradient iv) Limiting gradient. **(10 Marks)**

b. While aligning a hill road with a ruling gradient of 6 percent horizontal curve of 60 m is encountered. Find the compensating gradient of the curve. **(04 Marks)**

c. A valley curve is formed by descending gradient of 1 in 25 meeting an ascending gradient of 1 in 30. Design the length of valley curve to full fill both comfort condition and head light distance requirement for a design speed of 80 kmph. Assume allowable rate of change of centrifugal acceleration c = 0.6 m/sec^2. Assume t = 2.5 sec f = 0.35. **(06 Marks)**

6 a. Mention the principles to be considered in the good design of intersection. **(05 Marks)**
b. Differentiate between at–grade and grade separated junction. **(04 Marks)**
c. What is median? What are the functions of medians? **(06 Marks)**
d. Define channelization. Mention the purposes of channelization. **(05 Marks)**

7 a. Draw a neat diagram of rotary intersection (round about) and show the different elements? **(10 Marks)**
b. What is clover leaf interchange and what are its advantages? Draw a neat diagram of clover leaf. **(06 Marks)**
c. Explain the advantages and disadvantages of an over pass. **(04 Marks)**

8 a. Mention the importance of highway drainage. **(05 Marks)**
b. Draw the section of surface drainage system in urban roads and explain briefly. **(05 Marks)**
c. The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is 0.9 m^3/sec. design the cross section and longitudinal slope of trapezoidal drain assuming the bottom width of trapezoidal section to be 1.0 m and cross slope to be 1.0 vertical and 1.5 horizontal. The allowable velocity of flow in the drain is 1.2 m/sec and mannings roughness co-efficient is 0.02. **(10 Marks)**

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10CV765

Seventh Semester B.E. Degree Examination, June/July 2015
Air Pollution and Control

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Draw neat sketches.

PART – A

1 a. Classify the different sources of air pollution indicating typical pollutants. Explain them briefly. **(10 Marks)**

b. Write down chemical reactions involved in the formation of photochemical oxidants. Also give effects of those pollutants. **(10 Marks)**

2 a. How does the air pollution effects on the materials? Explain the processes. **(10 Marks)**

b. Explain the case of BHOPAL GAS TRAGEDY with respect to location, period, cause, condition, deaths and responsible air pollutant. **(10 Marks)**

3 a. Explain the wind speed recorder and wind direction recorder with the aid of neat sketches. **(10 Marks)**

b. Explain how the plume behaves with respect to the different atmospheric stability conditions. **(10 Marks)**

4 a. What are inversions? Explain different inversions that associates with environment. **(10 Marks)**

b. Describe the factors governing the industrial plant location. **(10 Marks)**

PART – B

5 a. What are the different factors to be considered while air sampling? **(04 Marks)**

b. Write about the sampling methods for collecting gaseous air pollutants. **(08 Marks)**

c. Explain high volume air sampler for sampling suspended particulate matter. **(08 Marks)**

6 a. On what principal the settling chamber works? Explain with advantages and disadvantages. **(10 Marks)**

b. Classify different types of electro static precipitators. Explain the cleaning mechanisms adopted for fabric filters. **(10 Marks)**

7 a. What are the sources of air pollution in automobiles? Explain. **(10 Marks)**

b. Describe ozone layer depletion and its pros and consequences. **(10 Marks)**

8 Write a short notes on the following :

a. Air act (Prevention and control) 1981

b. Isokinetic sampling

c. In door air pollution

d. Rignlemann chart for smoke measurement. **(20 Marks)**

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