May - June-15

Civil Sub:- DDSS Date:- 12-5-15

(OLD COURSE) **QP Code : 4221**

(4 hrs)

N.B. Total Marks-100

1) Question No. 1 is **compulsory**. Attempt **any four** out of remaining six questions.
2) Figures to the **right** indicate full marks.
3) Assume suitable data if needed but justify the same.
4) Use of IS 800-2007 and steel table **is permitted.**
5) Draw **neat sketches** wherever necessary to support solutions/ designs.

Q.1 a) What do you mean by plastic, compact, semi-compact & slender section? Which type of section is preferred? (5)

b) What do you mean by intermittent fillet weld? Where do we use it? Give design steps. (5)

c) What do you mean by external & internal wind pressure coefficient? On which factors do they depend? (5)

d) What is the advantage of laterally restrained beam? How compression flange is restrained? (5)

Q.2 A column section consisting of 2ISMC 250 which are placed face to face at spacing of 400 mm between webs. Determine the capacity of section if the height of column is 6 m having both ends of column held in position but not restrained against rotation. Also design suitable lacing system. (20)

Q.3 Four columns (one at each corner) are provided for an industrial shed of plan dimension 6 m x 6 m. Design a beam supported between two columns. Top flange of beam is embedded in 250 mm thick RCC slab. The depth of beam is restricted to 600 mm. Each beam has to support a 230 mm thick brick masonry wall of 1.2 m height. Assume imposed load on slab as 4 KN/m^2 (20)

Q. 4 A truss member of 2.2 m length has to carry of 80 KN (Comp), 110 KN (Comp) & 150 KN (Tension) due to dead load, imposed load and wind load respectively. Design the member and its connection. Assume that the given loads are service loads. (20)

Q.5 Design the gusseted base for a column ISHB 250 with cover plate 300 mm x 20 mm one in each flange. The column carries a factored load of 2700 KN. Also design the concrete pedestal. (20)

Q.6 For an industrial shed of plan dimensions 16m x 20 m, trusses with 16 m span, are provided at spacing 4 m c/c. The central rise of truss is 2m. Design a critical purlin if there are four panel points on each principal rafter. Assume suitable roof covering material, accessibility condition and 1200 N/m^2 suction wind pressure on each slope. (20)

Q.7 a) A beam ISMB 400 transmits an end reaction of 240 KN (factored) to the flange of a steel column ISHB 250. Design a welded stiffened seat connection. (10)

b) A 5 m long beam carries 120 KN/m factored load on entire span, transfers this load at each end to the supporting column ISHB 250 through bracket connection. There are two bracket plates of 16 mm thickness, each being bolted with the flange of column.

Design the bracket connection if the beam end reaction has to act at distance 210 mm away from the centre of column web. (10)

RJ-Con. 8445-15.

Day/Time | 8:30-9:30

Te sem-VI (Rev) May-June-15

Civil Sub:-GE-II Date:-12-5-15

QP Code : 4971

(3 Hours) **[Total Marks : 80**

Note:
(1) Question No. **1** is **compulsory**.
(2) Answer any **three** out of remaining **five** questions.
(3) Assume **suitable** data wherever necessary.

1. Answer any **four**

(a) Draw the free body diagram of forces for an embankment in c- ϕ soil with circular failure surface and define the notations used. Also determine the factor of safety with respect to cohesion for a submerged embankment 25 m high and having a slope of 40^0. The properties of soil are $\varphi = 10^0$, $c = 40$ kN/m^2, $\Upsilon_{sat} = 19$ kN/m^3, Taylor's stability number, $S_n = 0.097$. 5

(b) An unsupported excavation is to be made in soil having $\varphi = 12^0$, $c = 19$ kN/m^2, $\Upsilon = 19$ kN/m^3. What is the maximum depth of unsupported excavation in a soil? and draw the active pressure distribution diagram. 5

(c) Considering Coulomb's theory of lateral earth pressure, draw and define the forces acting on the cohesionless backfill at failure under active state behind a retaining wall. Also, why are retaining walls usually designed for active earth pressure? 5

(d) Explain the basic difference in the theoretical bearing capacity computation of shallow and deep foundations. 5

(e) Define allowable bearing capacity of soil and what is the effect of increase in width and depth of a footing on the bearing capacity and settlement behaviour of footing resting on (i) sand and (ii) clay? 5

(f) In what respect does the design of braced cuts differ from that of a retaining wall and What are apparent earth pressure diagrams used in the design of braced cuts? 5

2. (a) Derive an expression for factor of safety of an infinite slope in a c-Φ soil when there is a steady seepage parallel to the slope. 7

(b) A deep cut of 12 m depth is made in natural soil for the construction of a road. The properties of soil are: cohesion = 30 kN/m^2, angle of internal friction $=15^0$ and a unit weight = 20 kN/m^3. The slope angle of the cut is 35^0. Consider a trial slip circle of radius 20 m passing through the toe and cutting the top ground surface at a distance 5 m from top edge. Determine the factor of safety with respect to cohesion for the given trial slip circle by friction circle method. Assume factor of safety w.r.t. friction as 1.5. 8

(c) Critically compare Rankine's theory with the Coulomb's lateral earth pressure theory. 5

3 (a) Explain Culmann's method for the determination of active earth pressure on retaining wall considering the effect of line load on backfill. 8

(b) A 7 m retaining wall with a smooth vertical back face has a stratified back fill and a surcharge load of 10 kpa. The properties of soil are as follows: up to 3.5 m height from top:- unit weight = 15 kN/m^3, angle of shearing resistance = 30^0 and cohesion = 0. Below 3.5 m level:- unit weight = 20 kN/m^3, angle of shearing resistance = 10^0 and cohesion = 10 kpa. Draw the lateral active earth pressure diagram and estimate the resultant thrust on the wall and its position. 8

(c) What are the different types of conduits and the factors that affect the load on a conduit? 4

[TURN OVER

(a) For the cantilever sheet pile wall shown in Figure 1, compute the embedment depth below the dredge line. 10

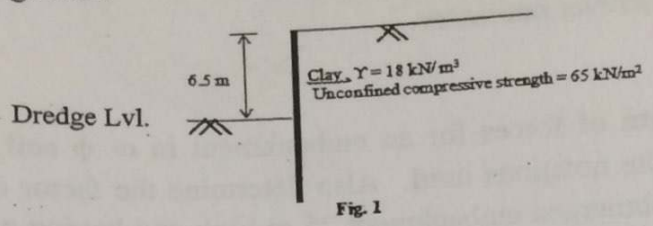


Fig. 1

(b) Differentiate between general, local and punching shear failure of shallow foundations. 5

(c) Describe how the bearing capacity of soil for shallow foundation can be determined from standard penetration test. 5

(a) Check the stability of the wall shown in Figure 2. Unit weight of concrete = 24 kN/m³. 10

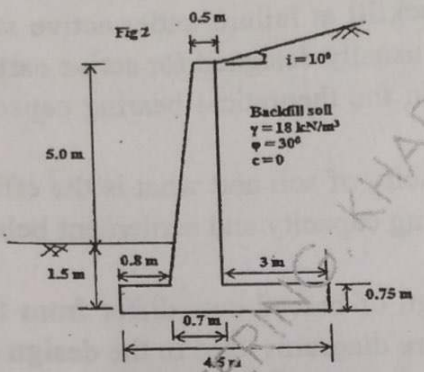


Fig 2

Foundation soil: Υ = 19 kN/m³, Φ = 20°, C = 40 kpa, δ = 13°
Safe bearing capacity = 500 kpa

(b) A circular foundation of 2.5 m diameter carries a load of 2500 kN. The soil has following properties: $\Upsilon = 19$ kN/ m³, $\Phi = 30^0$, c = 4 kN/ m², $N_c = 37.2$, $N_q = 22.5$, $N_\Upsilon = 19.7$. Using Terzaghi's theory,
(a) Find the depth at which the foundation should be located to provide a factor of safety of 3.
(b) What is the depth of location of foundation if there exists a water table close to the ground surface? 10

(a) Explain the internal stability of mechanically stabilized retaining wall. 5

(b) Explain the method of computation of settlement of pile groups in clayey soil. 5

(c) A precast concrete pile of diameter 450 mm is driven into stiff clay. The unconfined compressive strength of the clay is 200 kN/m². Determine the length of pile required to carry a safe load of 400 kN with factor of safety = 2.5. Assume adhesion factor = 0.55. 5

(d) Following data was obtained in a vertical pile load test on a 300 mm diameter pile. Plot the load-settlement curve and determine the allowable load as per IS code.

Load (kN)	50	100	200	300	400	500	600
Settlement (mm)	2.5	4	9.5	16.5	27	40.5	61

5

4971

T.E (Civil) Sem-VI TRE-II May-15 Old

Civil Sub:- TRE-II Date: 18/5/15

(OLD COURSE) Q.P. Code : **4224**

(3 Hours) [Total Marks : 100

N.B. : (1) Question No.1 is compulsory

(2) Attempt any four questions from remaining six questions.

(3) Assume appropriate data if necessary and state them clearly.

1.Solve any four : - 20

(a) State the function fulfilled by transition curve.

(b) What do you mean by scouring and how scour depth is determined.

(c) Differentiate between highway pavement and Airport pavement.

(d) Explain ESWL and the concept in the determination of the equivalent wheel load.

(e) Write short note on PCU and VDF

2. (a) State the objectives of widening of pavement on horizontal curves? What are the factors on which the design of widening depends. Explain 10

(b) Enlist different types of rigid pavement failures. Explain with neat sketches. 10

3. (a) Calculate the economic span.Also derive equation used stating assumption clearly. 10

Span (m)	4	8	12	15
Cost of girder (Rs)	1600	8000	14000	24000
Cost of one pier & foundation (Rs)	18000	20000	22000	28000

(b) Define :- 10

(i) Flakiness Index

(ii) Elongation index

And also state the importance of that.

4. (a) Calculate the maximum permissible speed on a horizontal curve of radius 125m of a highway designed for a speed of 65km/hr to carry mixed traffic if the super elevation is not to exceed the Specifies value of IRC. 10

(b) Explain with the aid of neat sketches the methods of eliminating camber and introduction of super elevation. 10

(TURN OVER)

RJ-Con. 9362-15.

N.B.: 1. Ques

5. (a) What are the various test carried out on Bitumen. Explain all test in brief. 10

(b) Write short note on :- 10

(i) 30th highest hourly volume.

(ii) Types of bearings used in bridge

6. (a) Explain in detail Geotaxtile & geogrid in highway . 10

(b) A National Highway passing through a rolling terrain has a horizontal curve of radius 500mm Design length of transition curve assuming suitable data 10

7. Write short note on :- 20

i. Importance of highway maintenance
ii. Rotary Island
iii. Design steps for rigid pavement
iv. Regulatory signs

T.E Sem VI (CBGS) DDSS May-15

Date:-18/5/15

Civil

Sub:- DDSS

QP Code : 4975

(4 hrs) Maximum Marks-80

N.B.-

1. Question no, 1 is **compulsory**, Attempt **any three** out of remaining **four** questions.
2. Draw neat & proportionate sketches wherever necessary.
3. Use of IS-800 and steel table **is permitted.**
4. Assume suitable data if necessary but justify the same.

Q.1 The flooring system for an industrial shed is as shown. Design the beams SB_1, MB_1 and the connections between them. Use I- sections for beams & provide cover plates if necessary. Top flanges of beams are at same level and embedded in concrete of 200 mm thick RCC slab. The parapet wall of 230 mm thickness and 1.2 m in height is provided on all peripheral beams. (32)

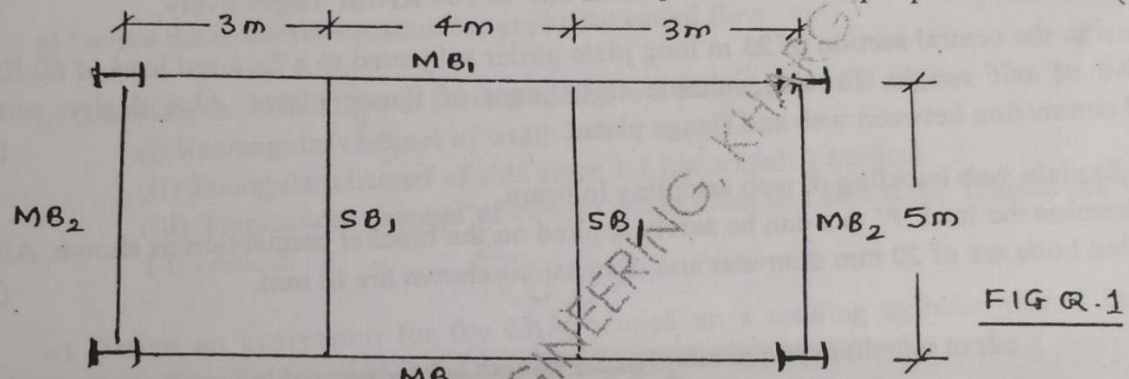


FIG Q.1

OR

Q.1 Figure shows the configuration of a Compound Fink roof truss having span as 12 m, rise 3 m with spacing of trusses 4 m c/c. Take a section 1—1 and calculate forces in members BC, FC and FG due to dead load, live load and wind load. Also design the members. Assume suction pressure on both slopes as 5 KN/m^2. (32)

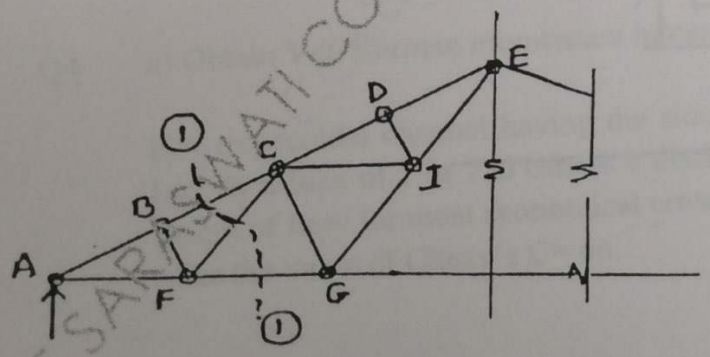


FIG Q.1

Turn Over

JP-Con. : 9307-15.

QP Code :

NB. : (1) Question No.

Q.2 (a) Two channels ISMC 300@ 71.6 Kg/m are placed back to back to form a laced column. The height of column is 9 m having both ends effectively held in position & also restrained against rotation. Determine load carrying capacity of column if

(i) the spacing between their webs is 160 mm
(ii) the spacing between their webs is 180 mm
(iii) the spacing between their webs is 200 mm

Which of the above arrangement is advisable? Give reason. (12)

(b) Develop the equation for bending moment acting on a batten. (4)

Q.3 An ISHB 300 with one cover plate 400 mm x 16 mm on each flange is used as a column for effective height of 4.8 m. Find the load carrying capacity of column. Design the suitable welded connection between cover plate and I-section. Also design the suitable slab base. Assume safe bearing pressure on concrete and soil as 6000 KN/m^2 & 160 KN/m^2 respectively. (16)

Q.4 Design the central section of 25 m long plate girder subjected to a factored load of 60 KN/m inclusive of self weight. Provide suitable curtailment of flange plates. Also design suitable welded connection between web and flange plates. (16)

Q.5 (a) Explain web buckling & web crippling in beam. (4)

(b) Determine the load 'P' that can be safely applied on the bracket connection as shown. All the connection bolts are of 20 mm diameter and dimensions shown are in mm. (12)

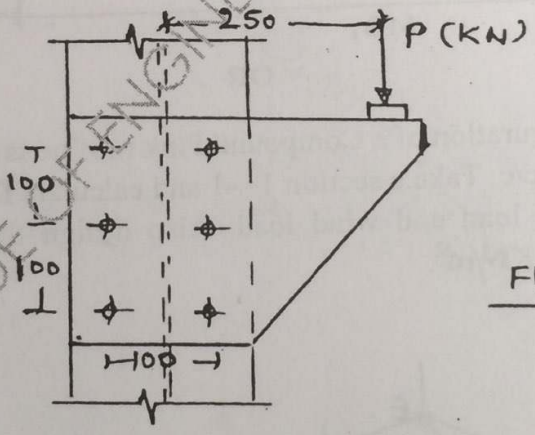


FIG Q.5(b)

TE (Sem VII) Civil AH-II

Sub:- AH-II OLD Date: 22-5-15

Civil

(OLD COURSE) QP Code : 4227

(3hours) [Total Marks-100]

NB. : (1) Question **No. 1** is compulsory

(2) Attempt any **four** questions out of remaining six questions.

(3) Assume suitable data where required and clearly state the same.

Q1 Solve any four of the following 20

(a) Boundary layer separation
(b)What do you understand by steady and unsteady flow in the case of channels?
(c)Write short note on Aero foils
(d) Define the term drag and lift
(e) Explain M1, M2 and M3 Profiles

Q2 a) Derive the dynamic equation for gradually varied flow 10

b) Calculate the critical depth corresponding to a discharge of 6.0 m^3/s in 10
(i) Rectangular channel of width 3m.
(ii) Triangular channel of side slope 1.5 horizontal: 1 vertical
(iii) Trapezoidal channel of bottom width 2.0m and side slope 1Horizontal to 1.0 vertical.

Q3 a) Derive an expression for the lift produced on a rotating cylinder placed in a uniform flow field such that the axis of the cylinder is perpendicular to the direction. 10

b)The discharge of water through a rectangular channel of width 8m is 15 m^3/s when depth of flow of water is 1.4 m. Determine 10
i) Specific energy of flowing water
ii) Critical depth and critical velocity
iii) Value of minimum specific energy

Q4 a) Obtain Von Karman momentum integral equation. 10

b)A trapezoidal channel having the side slope equal to 60° with the horizontal and laid on aslope of 1 in 750 carries a discharge of 10 m^3/s. Find width at the base and length of flow for most economical cross section.
Take the value of Chezy's C= 66. 10

(P.T.O.)

Q5 a) Show that the head loss in hydraulic jump formed in a rectangular channel may be expressed as 10

$$\Delta E = (v1 - v2)^3 / 2g\,(v1 + v2)$$

b) Derive the conditions for circular section to be most economical 10

Q6 a) Design an irrigation channel in alluvial soil according to Lacey's silt theory with the following data. 10

Full supply discharge = 10 Cumecs
Lacey's silt factor = 0.9
Channel side slope = ½ (H): 1 (V)

b) Compare Kennedy's theory and Lacey's theory 10

Q7 a) Derive silt supporting capacity of channel according to Kennedys theory. 10

b)Distinguish between deformation drag, surface drag and form drag. In the case of sphere discuss their relative importance at various increasing values of Reynolds number. 10

Civil Sem VI (Applied Hydraulics) Rev.

Date: 22-5-15

Civil

Sub:- AH-II

QP Code : 4977

(3 hours)

Note: Max. Marks 80

Question no.1 is compulsory

Solve any 3 questions out of remaining

Assume data wherever necessary and clearly mention the assumptions made.

Draw neat figures as required.

1. Answer any 4 of the following. 20
   a. Explain surface profiles in open channel
   b. Explain Boundary Layer Separation and control measures
   c. Compare Kennedy's and Lacey's theory
   d. Explain specific energy curve.
   e. Write a note on Standing Wave Flume.

2. a. A trapezoidal channel with a side slope of 1:1 has to be designed to convey 10 m^3/sec at a velocity of 2 m/sec, so that the amount of concrete lining for the bed and sides is minimum. Calculates the area of lining required for one meter length of channel. If the rugosity coefficient N = 0.015, calculate the bed slope the channel for uniform flow. 10

   b. Water flows at the rate of 1m^3/sec along a channel of rectangular section 1.6 m in width. Calculate the critical depth. If a standing wave occurs at a point where the upstream depth is 0.2 m, what would be the rise in water level produced and the power lost in standing waves. 10

3. a. A 1.6m wide, 5m long plate moves through stationary air of density 1.22 x 10^{-3} gm/cc and viscosity 1.8 x 10^{-4} poise at a velocity of 1.75 m/sec parallel to its length. Determine the drag force on one side of the plate (a) assuming laminar flow conditions, (b) assuming turbulent flow condition. 12

P.T.O

b. A kite of dimensions 0.8 x 0.8m and weighing 6 N is maintain in air at an angel of 10° to the horizontal. The string attached to the kite makes an angel of 45° to the horizontal and at this position, the drag and lift coefficients are estimated to be 0.6 and 0.8 respectively. Determine wind speed and tension in the string. 08

4. a. Water flows in a rectangular channel of 4 m width at a depth of 2.50 m and a velocity of 2.25 m/sec. If the width of channel is reduced to 2.50 m and the bed of channel is raised by 0.20m at a section, how will the level of water surface in the channel be affected? 10

b. Design an irrigation channel in alluvial soil according to Lacey's silt theory. Given the following data, slope of channel = 1:5000, Lacey's silt factor = 0.9. 10

5. a. Derive boundary layer thickness, local coefficient of drag and coefficient of drag for the given velocity profile: 15

$$\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$$

b. Explain discharge curve in open channel. 05

6. a. A circular cylinder of 1m diameter and 10 m length is rotated at 420 rpm about its axis when it is kept in air stream with 11.0 m/sec velocity perpendicular to its axis. Determine (i) circulation around the cylinder, (ii) theoretical lift and lift coefficient, (iii) position of stagnation point, (iv) actual drag and lift force on the cylinder and (v) actual resultant force and its direction. 10

b. Derive dynamic equation for gradually varied flow in case of wide rectangular channel. Also state assumptions made for the same. 10

— END —

Scm VI old / Civil / EE I

Sub:- EE-I

May-15

Date: 28/5/15

Civil

(OLD COURSE) **QP Code : 4230**

(3 Hours) **[Total Marks : 100**

SET 2

(1) Question No.1 is compulsory

(2) Attempt any Three questions out of Five questions

(3) Assume suitable data wherever necessary

Q1. Answer any Four. 20 M

1. What is the necessity of Water supply schemes in the present day community?
2. What is short circuiting, Explain type of settling.
3. Explain Jar Test.
4. What are the characteristics of hazardous waste
5. What factors will you consider while designing plumbing system for water supply to a house?

Q2. 1. The following are the data given of a change in diameter effected in laying a water supply pipeline. The change in diameter is gradual from 20cm at A to 50cm atB. Pressures at A nad B are 0.8 kg/cm2 and 0.6 kg/cm2, respectively with the end B being 3 meters higher than A. If the flow in pipeline is 200 lit/sec find (i) direction of flow and (ii) The head lost in friction between A and B. 10 M

2. What is meant by design periods and Population forecasts? Why is it necessary in the design of public water supply schemes? What are the different methods to forecast population. 10 M

Q3. 1. Explain dual system of distribution and state its advantages. 5M

2.Explain the causes for wastage of water in public water supplies and methods of its prevention 5 M

3.The water level of a reservoir is at 50 m. Water is drawn from it through a gravity main of 1.0 km, the elevation of distribution area is 10m. It is desirable to have a maximum residual pressure of 12m in the distribution system. Find the required diameter of the gravity main to serve a population of 1 Lakh at per capita rate of 200 l/d. Assume f=0.005. 6 M

4. Explain the disposal methods of MSW 4 M

Q4. 1. Design a plain sedimentation tank (rectangular) to treat 2 MLD with 2 h detention period and overflow rate less than 50000 litres per day per unit surface area. If the water contains 600 mg/l of suspended solids, 33 % of which are settleable, calculate the volume for sludge storage for 30 days cleaning period. 10 M

[TURN OVER

Sem. VI Rev. TRE II Civil May-15
Date:- 28/5/15

Civil Sub.- TRE-II

QP Code : 4980

(3Hours) [Total marks : 80

N.B (1)Question **No. 1 is compulsory.**
(2)Attempt any **Three** out of remaining **Five**
(3) Assume any other **data** if **required.**
(4) Illustrate your answers with neat **sketches** wherever **required.**

1. Attempt any **four.** 20

(a) In a certain project of highway construction the reconnaissance survey has identified three possible alignments. State the important facts that would effect the choice of one particular way in preference to the other.

(b) What do you mean by 'scouring' and how "scour depth" is determined?

(c) Draw a typical cross section of a highway on embankment and show the various flexible pavement layers.

(d) Observation were recorded in a 100m stretch of the road, the travel time for vehicles to ply this section is as follows:

Vehicles	Travel time(sec)
10	12
07	03
30	15

What would be Time mean speed and Space mean speed.

(e) Differentiate between Radius of relative stiffness and equivalent radius of resisting section.

2. a. Calculate the ESWL for a wheel load of 2050kg in a dual wheel axle to be applied on a road of 300mm thick. The distance between centres of wheel to be taken as 250mm and the edge distance between tyres as 120mm. 08

b. Why is it important for a highway engineer to study the properties and behavior of soil, aggregate and bituminous materials? State their desirable properties. 12

[TURN OVER

3. a. What are the requirements of good joints? Why are joints provided in cement concrete roads? 08

b. Show that the design thickness of a concrete pavement slab is safe for combined load and temperature stresses for edge loading conditions given the following data 12

Design thickness=20cm, Impact factor=10%, Maximum wheel load=4080kg, Modulus of elasticity of concrete=3×10^5kg/cm^2, Modulus of subgrade reaction=6kg/m, , Tyre pressure=7kg/cm^2

Poisson's ratio of concrete=0.2Slab dimensions=4.5×3.8m, Thermal co-eff. Of concrete=8×10^{-6}/°C,Temperature difference during the day=0.5°C/cm

Allowable flexural strength of concrete=35kg/cm^2

L/l (or) W/l	C	L/l (or) W/l	C
1	0.000	7	1.030
2	0.040	8	1.077
3	0.175	9	1.080
4	0.440	10	1.075
5	0.720	11	1.050
6	0.920	12	1.000

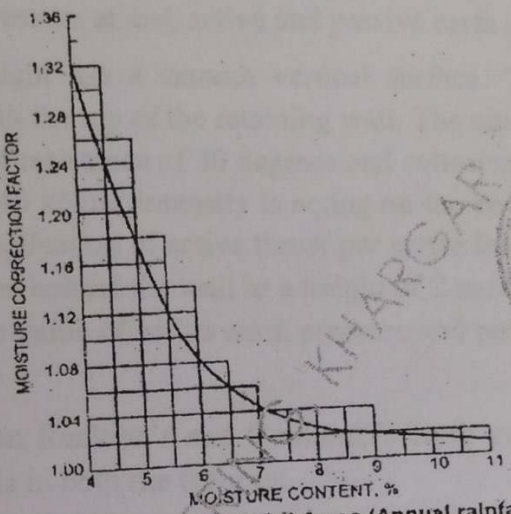
4. a. Speed and delay studies are conducted on a stretch of road measuring 4km in NS direction. From this data determine Journey speed and running speed of traffic stream in either direction. Determine average values of volume too. 15

Trip No.	Direction	Journey time		Delay time		Vehicles		
		min	sec	min	sec	Overtaking	Overtaken	From opposite direction
1	N-S	6	35	1	30	5	9	250
2	S-N	7	00	1	40	6	3	180
3	N-S	6	50	1	30	5	3	280
4	S-N	7	50	1	30	2	1	200.
5	N-S	6	00	1	00	3	4	230
6	S-N	8	15	2	20	2	2	150
7	N-S	6	25	1	30	2	5	300
8	S-N	7	30	1	40	3	2	160

b. Explain the term traffic volume. Indicate how the traffic volume data are presented and the results used in traffic engineering 05

[TURN OVER

5. a. Benkelman beam deflection studies were carried out on a highway pavement with 50mm thick bituminous surface course, when the mean pavement surface temperature was 40°C and the field moisture content of subgrade soil was 5.5%. The soil is found to be sandy and the annual rainfall of the region is 950mm.The characteristic deflection value of the selected sub stretch is found to be 1.32mm. Determine the corrected deflection value after applying the corrections for temperature and variation in subgrade moisture. 10



Sandy / Gravelly Soil for Low Rainfall Areas (Annual rainfall < 1300 mm)

b. Enumerate the broad classification of maintenance activities. 10

6. a. State the importance of extra widening required on a horizontal highway pavement. Calculate extra widening required for a pavement of 7.5m on a horizontal curve of radius 300m if the longer wheel base of vehicle on the road is 6.5m.Design speed is 100km/h. Compare the value obtained with IRC recommendations. 10

b. What is grade compensation in geometric design of highways? Why is it essential on curves? While aligning a hill road with a ruling gradient of 6%, a horizontal curve of radius 60m is encountered. Find the grade compensation and the compensated gradient at curve. 10

(OLD COURSE)

(3 Hours)

QP Code : 4234

[Total Marks : 100

(1) Question No. 1 is **compulsory.**
(2) Attempt any **four** out of remaining **six** questions.
(3) Assume **suitable** data wherever necessary.
(4) **Numbers** to the **right** indicate **full** marks.

1. (a) What are the causes of slope failure? and what measures can be taken to prevent slope failures? 5

   (b) Explain pile foundations on the basis of load transfer and method of uses. 5

   (c) Explain the assumptions made in Terzaghi's bearing capacity theory of shallow foundations 5

   (d) Differentiate between earth pressure at rest, active and passive earth pressure. 5

2. (a) A retaining wall 4 m in height has a smooth vertical surface. The backfill has a horizontal levelled surface with the top of the retaining wall. The unit weight of backfill is 18 kN/m^3, shearing angle of resistance of 30 degrees and cohesion zero. A uniformly distributed surcharge load of 40 kN/m^2 intensity is acting on the back fill. (i) Calculate the magnitude and point of application of active thrust per metre length of the retaining wall. (ii) If the water table rises behind the wall to a height of 2 m above the base of the retaining wall what will be the value of active earth pressure and point of application of active thrust? 10

   (b) Explain the difference between Rankine's and Coulomb's earth pressure theories and explain the methods of analysis in both the theories. 10

3. (a) Explain positive and negative projecting conduits. 10

   (b) A cantilever type sheet pile having a height of 6 m above the dredge line supports the backfill of sand having an angle of internal friction of 30° and unit weight of sand is 18 kN/m^3. Water table is at 3 m above dredge line. Find the depth of embedment for the sheet pile if the soil below the dredge line is clay having cohesion of 50 kN/m^2. The saturated unit weight of both sand and clay below water table is 20 kN/m^3. 10

4. (a) Explain the factors affecting the bearing capacity of soil. 10

   (b) A rectangular footing has a size of 2 m by 3 m and transmits a load of a column at a depth of 1.5 m. Determine the safe load which the footing can carry at a factor of safety of 3 against shear failure using Terzaghi's method. Consider unit weight of soil = 18 kN/m^3, effective angle of internal friction = 30°, effective cohesion = 10 kN/m^2, N_c = 37.2, N_q = 22.5, N_γ = 19.7 10

5. (a) A concrete pile 350 mm diameter is driven into dense sand for a depth of 15 m. Estimate (i) the safe load for the pile and (ii) safe load if the water table is close to ground surface. Consider following properties for the sand: angle of internal friction = 30°, unit weight = 20 kN/m^3, coefficient of friction between sand and pile = 22.5, coefficient of earth pressure = 1.5, N_q = 16.5 Factor of safety = 2.5 10

   (b) How the bearing capacity of a group of piles is estimated in sand and clay. 10

[TURN OVER

6. (a) The slope is made of sandy clay with an effective angle of internal friction = 20°, effective cohesion = 25 kN/m^2, dry unit weight of soil = 16 kN/m^3, saturated unit weight of soil = 20 kN/m^3. Find the critical height of an infinite slope having a slope angle of 30° for the following cases (i) the soil is dry (ii) the water seeps parallel to the surface of the slope and (iii) slope is submerged. 10

(b) Explain pile load test and determination of allowable load from the test. 10

7. (a) Determine the loads in the three struts supporting an open cut. The depth of open cut is 8m and width is 4 m. The struts are located at 1 m, 4 m and 7 m from the ground level. The centre to centre spacing of the struts along the length of the cut is 3 m. The soil is sand having unit weight of 18.5 kN/m^3 and angle of internal friction = 38°. 10

(b) Explain the Mechanically stabilized retaining wall construction and stability check. 10

4234

~~EE I (Civil)~~ VI (REN) May-15

Civil Sub:- EE-I Date:- 3/6/15

Q.P. Code : 4984

N.B. (3 Hours) [Total Marks: 80]

1) Q.1 is compulsory
2) Attempt any 3 of remaining 4 Questions
3) Assume suitable data wherever necessary

Q.1. Attempt **Any Four** of the following (20)

1) Explain the importance of planned water supply scheme.
2) Enlist different population forecasting methods. Explain any one in detail.
3) Explain classification of distribution system with neat sketches.
4) Explain Environmental significance of pH and Colour in water supply engineering.
5) Criteria for selection of pump.
6) Write down characteristics of hazardous waste.

Q.2. A) With the help of following data, estimate the future population of the town in the year 2021, using Geometrical and Incremental increase method. (10)

Year	1951	1961	1971	1981	1991	2001
Population	40000	47500	60000	68000	72000	93000

B) Explain the physical, Chemical and Biological characteristics of water. Write the standards for potable water. (10)

Q.3. A) Design a rectangular sedimentation tank to treat 2 MLD of water. Assume detention period of 3 hours and flow through velocity of 7.5 cm/min. If the depth of tank is 3m, find the over flow rate and dimensions of tank. (10)

B) Enlist factors affecting coagulation. Enlist common coagulants used. Give equations of coagulation by Alum. (10)

Q.4. A) Explain the working of rapid sand filter (RSF) with neat sketch. Also mention advantages of RSF. (10)

B) Define water softening. Enlist different methods of softening. Explain Zeolite process with neat, sketch. (10)

Q.5. A) Explain various methods of "house - to - house" collection system and give relative points of comparison. (10)

B) Explain different methods of disinfection and its suitability. (10)

Q.6. Write short notes on following. (Any Four) (20)

A) Break point chlorination.
B) Disposal methods of solid wastes.
C) Testing of pipeline
D) Fluoridation and Defluoridation.
E) Air binding and mud ball formation in rapid sand filter (RSF)
F) Jar Test.

Civil Sub:-TRPC Date:- 9-6-15

QP Code : 4235

(OLD COURSE)

(3 Hours) **[Total Marks : 100**

N.B.: 1. Question no. 1 is compulsory.
Attempt any four out of remaining six questions.
2. Assume suitable data if necessary but justify the same.
3. Draw neat sketches wherever needed to support your solution.
4. Figures to the right indicate full marks.
5. Use of IS-456 is not permitted.

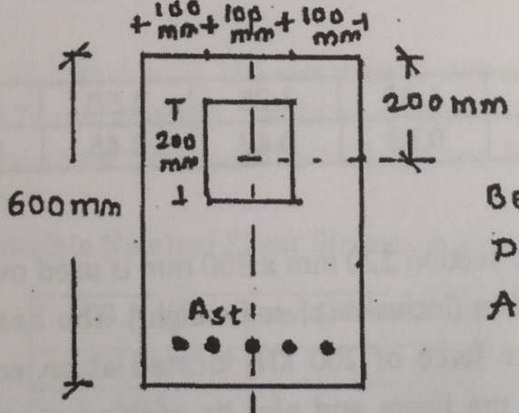
Q.1 (a) What is T-beam action? How will you calculate effective flange width b_f of a T-beam as per IS 456-2000? (5)

(b) Derive the expression for development length of plain bar in tension. Also write the code provision to use this expression for deformed bar under compression. (5)

(c) Write a short note on 'safe cable zone' in prestresssed concrete beam. (5)

(d) What is efficiency factor? Find its value for a prestressed concrete beam of circular cross section. (5)

Q.2(a) Figure shows the rectangular cross section of a RCC beam having a service duct. The size of this duct is 100 mm x 200 mm with its c.g. at 200 mm below the topmost fiber of beam section. Find MR of section if it is reinforced with 5 bars of 20 mm diameter at a clear cover of 30 mm Use concrete M20 and Steel of grade Fe415. (10)



(b) A RC beam of rectangular cross section 300 mm x 600 mm is reinforced with 5 bars of 20 mm dia on tension side and 4 bars of 16 mm dia on compression side, both at an effective cover of 40mm. Find the maximum stresses induced in concrete and steel (compression/tension) if the section is subjected to a sagging BM of 140 KN m. Adopt modular ratio m = 13.333. (10)

[TURN OVER

Q.3 (a) A Tee beam section has following particulars-
Effective width of flange = 1400 mm, thickness of flange = 120 mm
Width of flange = 250 mm, Effective depth = 500 mm.
Determine amount of steel reinforcement if the beam section is subjected to BM of 170 KN m. (10)
Use concrete M20 & steel Fe415.

(b) Design a simply supported slab for a room of clear dimensions 3 m x 5 m. The slab is resting on 250 mm thick brick wall on all four sides. Assume live load = 3 KN/m^2 and floor finish load as 1 KN/m^2. Adopt concrete M20 & steel Fe415. Sketch the reinforcement details.
Use BM coefficients- $\alpha_x = 0.088$ and $\alpha_y = 0.057$. (10)

Q. 4(a) Design completely a helically reinforced short circular column to carry an axial load of 1200 KN. Use concrete M25 & steel Fe415. (10)

(b) A RC column of rectangular cross section is reinforced with 8 bars of 20 mm dia at 40 mm effective cover. It is subjected to an axial load P = 500 KN along with moments M_x = 50 KN m and My = 30 KN m. Check the suitability of section as uncracked.
Use concrete M20 & steel Fe415. (10)

Q.5 Design an isolated square pad footing to support a column of size 300 mm x 300 mm. The column carries an axial load of 600 KN.
Take SBC of soil = 170kN/m^2, concrete M20 and Fe415. (20)

Q.6 (a) Design the shear reinforcement for a RC beam of effective c/s 300 mm x 500 mm, subjected to a maximum shear force of 160 KN. The beam is reinforced with 4 bars of 25 mm diameter. Use concrete M20 & steel Fe415. Refer table below. (10)

100As / bd	0.50	0.75	1.00	1.25	1.50	1.75
τ_c (N/mm^2)	0.30	0.35	0,39	0.42	0.45	0.17

(b) A prestressed concrete beam of section 120 mm x 300 mm is used over a simply supported span of 6 m to carry a udl of 4 KN/m (inclusive of self weight). The beam is prestressed by a straight cable carrying an effective force of 200 KN, located at an eccentricity of 50 mm. Find the location of thrust line in the beam and plot its position at quarter & central span sections. (10)

Q.7 (a) State various types of losses in prestress. How will you calculate the loss in prestress due to elastic shortening of a PC member? (7)

(b) In a pre-stressed concrete beam of cross section 200 mm x 300 mm and span 6 meters, an initial prestressing force of 400 KN is applied at an eccentricity of 70 mm, by tendons of area 400 mm^2 . Assuming E_s =2 x 10^5 N/mm^2 and E_c = 0.333 x 10^5 N/mm^2 anchorage slip= 1.5 mm; creep coefficient in concrete ϕ = 1; shrinkage of concrete = 0.002 and creep loss in steel + 3%. Find the total % loss of stress in tendons. (13)

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Te sem - VI (Rev') May - June - 15
~~TRPC (Rev) civil~~
Sub:- TRPC
Date: 9-6-15
Civil

QP Code: **4985**

(3 Hours) [Total Marks: 80]

Instructions: 1. Question No. 1 is **COMPULSORY.** 2. Answer any **THREE** from the remaining.
3. Each full question carries **EQUAL** marks. 4. **ASSUME** any suitable data, if needed.

1. a) Write a brief note on the Equivalent Concrete Area of a Reinforced Concrete member. **(04 M)**

b) Write down the formula for modular ratio proposed in IS 456:2000. What is the advantage of using IS value as different from a constant value m = 15 as is used in some other codes? **(04 M)**

c) Distinguish between one-way slab & two-way slab. **(04 M)**

d) What are the assumptions made in the design of Prestressed Concrete members? **(04 M)**

e) A Singly Reinforced concrete beam 250 mm wide & 400 mm deep to the centre of the tensile reinforcement has a span of 5 metres & carries a total UDL of 9000 N/m, inclusive of the self weight. Concrete is M20 & steel is Fe415. State whether the beam section is balanced, under-reinforced or over-reinforced. **(04 M)**

2. a) It is proposed to modify a singly reinforced balanced section so as to reduce its moment of resistance by reducing the area of steel by 50%. Find the ratio of the reduced moment of resistance to that of the balanced section. Use M20 concrete & Fe415 steel. **(08 M)**

b) A rectangular beam reinforced on both sides is 300 mm wide & 550 mm deep. The centres of the compression & tension steel are 50 mm from the respective edges. If the limiting stresses in concrete & steel are 7 MPa & 230 MPa respectively, determine the steel areas for a bending moment of 90 kNm. Take m = 13.33. **(08 M)**

c) Write a brief note on the loss of prestress in a Pre-Tensioned member due to elastic shortening of concrete. **(04 M)**

3. a) An R. C. beam of span 5 m is 250 mm wide & 500 mm deep to the centre of tensile steel, consisting of 4 bars of 22 mm diameter. The beam carries a load of 30 kN/m inclusive of self weight. Design the shear reinforcement (stirrups). Use M20 concrete & Fe415 steel. Max. nominal shear τ_{cmax} = 1.8 MPa. Refer Table 1. **(08 M)**

Table 1: Permissible Nominal Shear Stresses in Concrete Beams, τ_c (IS 456: 2000)

100 A_{st}/bd	τ_c (MPa) for M20 concrete
1.00	0.39
1.25	0.42

b) Write a brief note on the IS Recommendations for Development Length. **(04 M)**

c) An isolated T-Beam of span 5 m has a 800 mm wide & 180 mm thick flange. The overall depth is 500 mm & the width of rib (web) is 275 mm. The tensile steel consists of 4 bars of 25 mm diameter. Effective cover to the steel is 40 mm. If the permissible stresses in concrete & steel are 7 MPa & 230 MPa respectively, find the Moment of Resistance of the beam. Take m = 13.33. **(08 M)**

[TURN OVER

4. a) A rectangular RCC column section 700 mm deep & 450 mm wide is reinforced with 7 bars of 28 mm diameter, placed at an effective cover of 50 mm on both the sides, along the 450 mm side (i.e. along the width). Determine the maximum thrust on the section, which can be applied at a distance of 100 mm from the centre line (i.e. line bisecting the 700 mm side), if the compressive stress in concrete is not to exceed 7 MPa. Take m =13.33. (08 M)

b) A column 400 mm X 400 mm X 6 metres long has to support an axial load of 875 kN. Find the necessary reinforcement for the column. Use 16 mm diameter bars & 5 mm diameter ties. Use M20 concrete. Take safe stresses for concrete & steel as 5 MPa & 130 MPa respectively. (08 M)

c) Write a brief note on the externally & internally prestressed members. (04 M)

5. a) In a prestressed concrete beam 200 mm wide & 300 mm deep with 6 m. span, an initial prestressing force of 400 kN is applied at an eccentricity of 70 mm, by tendons of area 400 mm^2. Assuming $E_s = 2 \times 10^5$ MPa & $E_c = 0.333 \times 10^5$ MPa, anchor slip = 1.5 mm, creep coefficient in concrete $\Phi = 1$, concrete shrinkage = 0.0002 & creep loss in steel = 3%, find: i) loss of stress due to elastic shortening of concrete. ii) loss of stress due to anchorage slip. iii) loss of stress due to creep of concrete. iv) loss of stress due to concrete shrinkage. v) loss of stress due to creep in steel. vi) total percentage loss of stress in the tendons. (06M)

b) Design a slab over a room 5 m X 7 m as per IS code guidelines. The edges of the slab are simply supported & the corners are not held down. The Live Load on the slab is 3000 N/m^2. The slab has a bearing of 150 mm on the supporting walls. Use M20 concrete & Fe415 steel. Refer Table 2. (07M)

Table 2: BM coefficients for slabs spanning in 2 directions at right angles- S/S on 4 sides.

$l_y/l_x = r$	α_x	α_y	$l_y/l_x = r$	α_x	α_y
1.0	0.062	0.062	1.3	0.093	0.055
1.1	0.074	0.061	1.4	0.099	0.051
1.2	0.084	0.059	1.5	0.104	0.046

c) A square column 500 mm X 500 mm carries an axial load of 1500 kN. Design a square footing for the column. The safe bearing capacity of soil is 225 kN/m^2. Use M20 concrete & Fe415 steel. Checks for one way shear & two way shear are not required. (07 M)

6. a) A beam of symmetrical I-section spanning 8 m has flange width of 200 mm & flange thickness of 60 mm. The overall beam depth is 400 mm. Web thickness is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm at the centre & zero at the supports with an effective force of 100 kN. The live load on the beam is 2000 N/m. Draw the stress distribution diagram at the mid span section for: i) prestress + self weight ii) prestress + self weight + live load. Take the concrete weight as 25000 N/m^3. (07 M)

b) Write a note on the pressure line concept as applied to the prestressed concrete. (04 M)

c) What are the major defects of the Modular Ratio Method? (03 M)

d) Design a one-way simply supported slab supported on masonry walls. Clear span is 3 m, live load is 2500 N/m^2. Use M20 concrete & Fe415 steel. Provide a wall bearing of 120 mm at each end. Draw the reinforcement details. (06 M)
