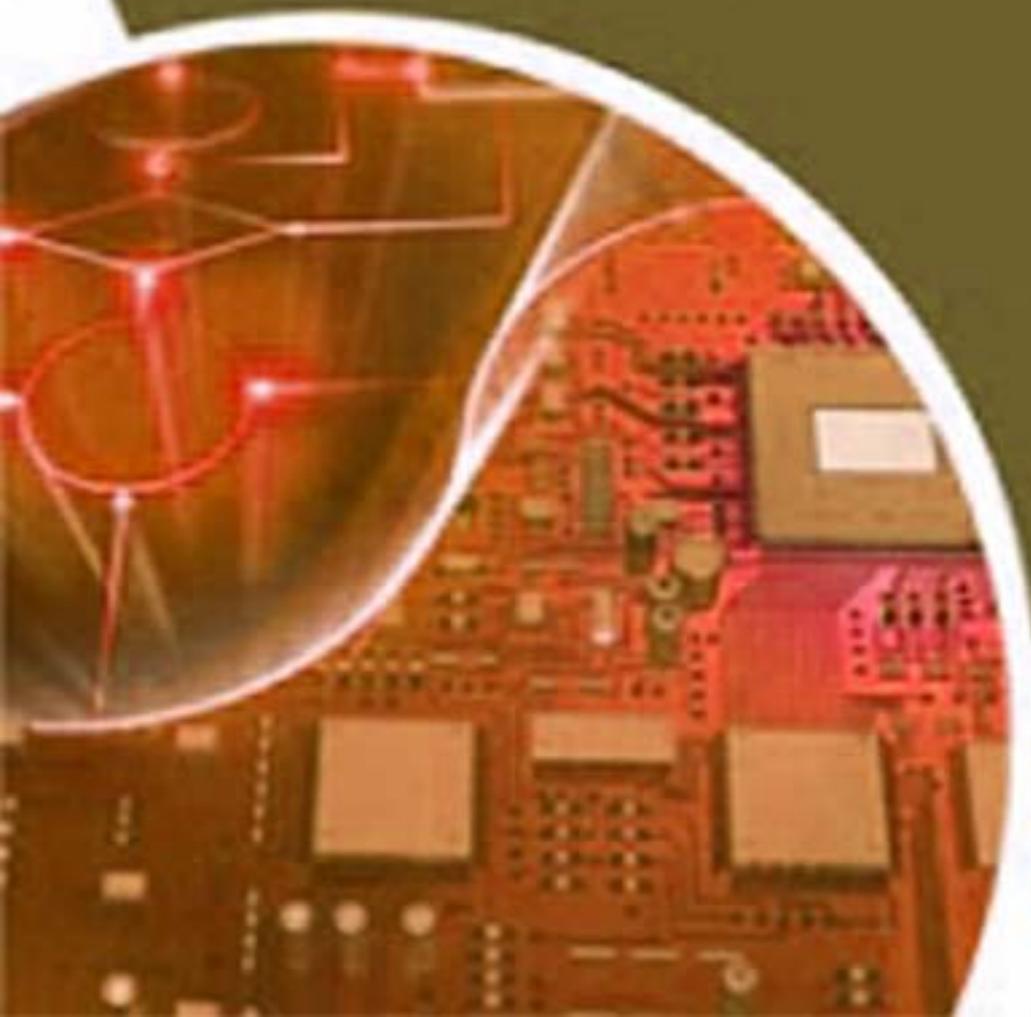


VTU 6th Semester Question Papers

Bachelor of Engineering

Civil Engineering
(2014)



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Sixth Semester B.E. Degree Examination, June/July 2014
Design and Drawing of RC Structures

Time: 4 hrs.

Max. Marks:100

- Note: 1. Answer TWO full questions from Part – A and ONE full question from Part – B.**
2. Use of IS:456–2000 and SP–16 is permitted.

PART – A

- 1** A simply supported two way slab is supported on all the sides by a 230 mm thick wall. The dimensions of the two way slab is 4.5m × 5.5m (clear). Following are the details of reinforcement.
- Thickness of slab = 150 mm
 - Along short span = # 12@ 130 mm c/c
 - Along longer span = # 10 @ 110 mm c/c
 - Negative steel for shorter span = # 12 @ 260 mm c/c 1.20 m long
 - Negative steel for longer span = # 10 @ 220 mm c/c 1.430 m long
 - Alternative rods are bent up/cranked
 - Corner mats are # 10 @ 120 mm c/c at top and bottom, in two layers on all the corners for a distance of 0.950 m on either side
 - Use M20 grade concrete and Fe415 grade steel

Draw to a suitable scale :

- Plan showing reinforcement details. (08 Marks)
- c/s at midspan along shorter span. (06 Marks)
- c/s at midspan along longer span. (06 Marks)

- 2** A RCC doglegged staircase has the following details :

- Staircase hall size (clear) = 2.3 m × 4.7 m
- Floor to floor height = 3.3 m
- Rise = 150 mm and tread = 250 mm
- Waist slab thickness = 150 mm
- Width of stair = 1.10 m
- Bearing = 230 mm
- Number of steps per flight = 10
- Main steel = # 12@ 250 mm c/c
- Distribution steel = # 8 @ 275 mm c/c

Two landing beams of size 230 mm × 250 mm are provided with 2 - # 12 at bottom and top. Stirrups are # 8 @ 200 c/c throughout.

Draw to a suitable scale :

- Plan. (06 Marks)
- Sectional elevation along second flight. (08 Marks)
- Bar bending schedule. (06 Marks)

- 3 A rectangular RCC column and footing has the following details :
- Column size = 400 mm × 600 mm
 Size of footing = 2 m × 3 m of uniform thickness 420 mm
 Depth of foundation below GL = 1 m
 Height of column to be shown above GL = 1 m
 Details of reinforcement
 Column : 8 - # 16 as main bars with # 8 @ 150 mm c/c lateral ties
 Footing : along length : # 12 @ 130 mm c/c
 Along width (central band) : # 12 @ 220 mm c/c
 Along width (end band) : # 12 @ 250 mm c/c
 Use M20 concrete and Fe415 steel
- Draw to a suitable scale, the following :
- Sectional plan of column and footing. (07 Marks)
 - Sectional elevation of column and footing. (08 Marks)
 - Prepare bar bending schedule for footing steel and column steel upto 1 m above GL. (05 Marks)

PART – B

- 4 Design a slab and beam type combined rectangular footing for two columns located 4.0 m apart. The columns 300 mm × 300 mm and 500 mm × 500 mm in size carry axial service loads of 600 kN and 900 kN respectively. The property line is 0.5 m from the centre line of first column. Safe bearing capacity of soil is 150 kN/m². Use M20 concrete and Fe415 grade steel. (40 Marks)
- Draw to a suitable scale :
- Longitudinal section of the footing. (15 Marks)
 - Cross section of the footing. (05 Marks)
- 5 a. Design a RCC portal frame having an effective span of 8.0 m and effective height of 4.0 m. The portals are spaced at 3.5 m c/c. The imposed load on slab is 2.0 kN/m². Assume SBC of soil as 200 kN/m². The bases of columns are fixed. Use M20 concrete and Fe415 steel. Design the continuous slab, portal frame and foundation. (40 Marks)
- b. Draw to a suitable scale the sectional elevation of half the portal frame showing the details of steel in beam, column and footing. Also show the cross-sectional details of beam at midspan and support and the sectional details of column. (20 Marks)

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Sixth Semester B.E. Degree Examination, June / July 2014
Environmental Engineering - I

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.**
2. Draw sketches wherever required.
3. Assume any suitable missing data.

PART – A

- 1 a. Discuss the environmental pollution due to human activities. (06 Marks)
 b. What is meant by per capita demand? List and discuss the factors that affect the per capita demand. (06 Marks)
 c. The following is the population data of a city available from past census records. Determine the future population of the city in 2030 by i) Arithmetical increase method and ii) Geometrical increase method. (08 Marks)

Year	1960	1970	1980	1990	2000
Population	25,000	28,000	34,000	42,000	47,000

- 2 a. What are the intake structures? Explain the factors to be considered while selecting a location for intake structures?. (06 Marks)
 b. What are the factors affecting selection of a particular type of pump? (06 Marks)
 c. Water has to be supplied to a town with one lakh population at the rate of 150 litres per capita per day from a river 1500m away. The difference in elevation between the lowest water level in the sump and the reservoir is 28m. If the demand has to be supplied in 8 hours, determine the size of the main and the brake horse power of the pumps required. Assume maximum demand as 1.5 times the average demand. Assume $f = 0.0075$, Velocity in the pipe 2.4m/sec and efficiency of pump 80 percent. (08 Marks)
- 3 a. Mention the permissible limits for the following parameters and explain the environmental significance of each : Hardness, Nitrate, Fluorides and Iron. (08 Marks)
 b. Write a note on properties of whole some water. (06 Marks)
 c. Briefly explain the water borne diseases and their control. (06 Marks)
- 4 a. Give complete sequence of a water treatment plant with a flow diagram and mention the function of each treatment unit. (08 Marks)
 b. Explain with chemical equations, what happens when alum is added to water? (06 Marks)
 c. The maximum daily demand at a water purification tank plant is 8 MLD. Design the dimensions of a suitable rectangular sedimentation tank for the raw water supplies. Take detention time period of 4 hours and the depth of 3.0mts. The velocity of flow is 20cm/min. (06 Marks)

PART - B

- 5 a. Explain in detail the theory of filtration. (08 Marks)
b. Explain with a neat sketch working of a pressure filter? (06 Marks)
c. Determine the dimensions of a set of rapid gravity filters for treating water required for a population of 50,000 with average rate of demand as 180 litres per day per person. Assume a peak factor of 1.8 by ignoring wash water requirements. Assume rate of filtration is 500ℓ/h/sq.m. (06 Marks)
- 6 a. Explain the terms pre – chlorination, post – chlorination, Break point chlorination and Super chlorination. (08 Marks)
b. Chlorine usage in the treatment of 20,000 cubic meter per day is 8kg/day. The residual after 10 min contact is 0.20mg/ℓ. Calculate the dosage in milligrams per litre and chlorine demand of the water. (06 Marks)
c. Briefly explain Zeolite process of hardness removal. (06 Marks)
- 7 a. What is meant by defluoridation? Explain with a line diagram the “Nalagonda technic” of defluoridation. (06 Marks)
b. What is aeration? Explain the type of aerators. (06 Marks)
c. Describe the various methods of distribution of water and discuss the advantages and disadvantages of each. (08 Marks)
- 8 Write explanatory notes with sketch on the following :
a. Fire hydrant.
b. Air valves.
c. Sluice valves.
d. Pressure relief valves. (20 Marks)

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Sixth Semester B.E. Degree Examination, June/July 2014
Geotechnical Engineering – II

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Assume missing data if any.**

PART – A

- 1 a. With a neat sketch of a sampler, define
 - i) Area ratio
 - ii) Inside clearance
 - iii) Outside clearance.
Also indicate recommended values. (06 Marks)
 - b. List and explain different types of samplers used in soil sampling. (08 Marks)
 - c. List the methods used for controlling ground water during excavation. Explain any one of these dewatering methods. (06 Marks)

- 2 a. List the assumptions made in Boussineq's and westergaards theories. (06 Marks)
 - b. Explain the: i) Pressure bulb; ii) Pressure distribution on horizontal plane; iii) Pressure distribution on vertical plane. (08 Marks)
 - c. A point load of 1000kN acts at the ground surface. Compute the vertical stresses at 8m depth.
 - i) On the axis of the load; ii) 2m away from the axis.
Use Boussineq's equations. (06 Marks)

- 3 a. What is flow net? What are its characteristics and uses? (08 Marks)
 - b. Explain with a neat sketch the method of locating phreatic line for a homogeneous earth dam without filter. (08 Marks)
 - c. Explain the terms: i) Exit gradient; ii) Piping failure. (04 Marks)

- 4 a. List the assumptions and limitations of Rankines earth pressure theory. (04 Marks)
 - b. Explain the Culmann's graphical construction for determination of active earth thrust. (08 Marks)
 - c. A retaining wall, 7.5m high retains cohesionless, horizontal back fill. The top 3m of fill has a unit weight of 18kN/m³ and $\phi = 30^\circ$ and the rest has a unit weight of 24kN/m³ and $\phi = 20^\circ$. Determine using Rankine's theory, the distribution of active earth pressure and total active earth thrust. (08 Marks)

PART – B

- 5 a. What are different types of slopes? Explain types of slope failures. What are the causes of slope failure? (06 Marks)
 - b. Explain the method of slices for stability analysis of sloper. (08 Marks)
 - c. An embankment is to be constructed with $C = 30\text{kN/m}^2$, $\phi = 20^\circ$, $r = 18\text{kN/m}^3$, $FS = 2$ and height 10m. Estimate the required side slope using Taylor's stability number. (06 Marks)

Slope angle	90	75	60	45	30	20	10
S_n	0.182	0.134	0.097	0.062	0.025	0.005	0

- 6 a. Explain the different modes of shear failure with the help of neat sketch. (06 Marks)
- b. What are the assumptions made in Terzaghi's theory? Write the expressions for ultimate bearing capacity of strip footing, square and circular footing. (06 Marks)
- c. A strip footing 1.2m wide is supported on a soil with its base at a depth of 1m below ground surface. The soil properties are $C = 15 \text{ kN/m}^2$; $\phi = 28^\circ$, $\gamma_t = 18 \text{ kN/m}^3$, $\gamma' = 10 \text{ kN/m}^3$. Determine the ultimate bearing capacity if water table is i) at great depth; ii) at the level of footing; iii) at ground surface. Take, $N_c = 32.36$, $N_t = 18.58$ and $N_r = 15.7$. Use Terzaghi's theory. (08 Marks)
- 7 a. Explain: i) Immediate settlements; ii) Primary consolidation settlements and iii) Secondary consolidation settlements. (06 Marks)
- b. Estimate the immediate settlement of a footing of size $2\text{m} \times 3\text{m}$ resting at a depth of 1.5m in a sandy soil whose compression modulus is 10 N/mm^2 . Footing transmits a pressure of 200 kN/m^2 . Take $\mu = 0.3$ and influence factor as 1.06. (06 Marks)
- c. The following results were obtained from a plate load test conducted on dry sand stratum using a square plate of size 0.3m.
- | | | | | | |
|------------------------------------|-----|-----|-----|-----|-----|
| Load intensity (kN/m^2) | 50 | 100 | 150 | 200 | 250 |
| Settlement (mm) | 1.2 | 2.4 | 4.8 | 9.6 | 32 |
- Determine the settlement of a square footing of width 1.5m, under a load intensity of 120 kN/m^2 . (08 Marks)
- 8 a. Explain the factors influencing the selection of depth of a foundation. (06 Marks)
- b. Write a note on selection of foundation based on soil stratification and load carried. (08 Marks)
- c. Explain the classification of pile foundation. (06 Marks)

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Sixth Semester B.E. Degree Examination, June/July 2014
Hydraulic Structures and Irrigation Design-Drawing

Time: 4 hrs.

Max. Marks:100

Note: 1. Answer TWO full questions from PART-A and ONE full question from PART-B.
 2. Assume data suitably if not given and mention the same.

PART – A

- 1 a. State and explain different types of storage zones with the help of neat sketch. (07 Marks)
- b. The monthly discharge volumes in million m³ for period of 24 months recorded at stream gauging site are: 3, 6, 16, 30, 18, 15, 10, 8, 6, 4, 3, 1, 2, 5, 17, 28, 20, 15, 12, 7, 5, 4, 3 and 2. Determine size of reservoir proposed at the gauging site if it is to maintain an assured supply of 8.33 million m³ per month. The water year may be taken as June-May. (08 Marks)
- 2 a. Explain different types of forces acting on a gravity dam. (07 Marks)
- b. Briefly explain elementary profile of a gravity dam. (08 Marks)
- 3 a. Explain briefly various causes of failure of earth dam. (06 Marks)
- b. Draw a neat sketch of earthen dam showing phreatic line with horizontal filter at downstream. (05 Marks)
- c. A flow net is to be plotted for a homogeneous earthen dam of height 22 m and free board 2.0 m. The results obtained are:
 Number of potential drops = 10
 Number of flow channels = 4
 The dam has horizontal filter of 30 m at downstream end and coefficient of permeability of dam material is 5×10^{-4} cm/sec. Calculate the discharge per metre run of dam. (04 Marks)

PART – B

- 4 Design the surplus work of a tank forming part of a chain of tanks.
 Combined catchment area = 25.89 sq.km
 Intercepted catchment area = 20.71 sq.km
 Maximum water level = +12.75
 Full tank level = +12.00
 Ground level at proposed site = +11.00
 Ground level below proposed weir upto a reach of 6 m (Fall) = +10.00
 Top width of tank bund = 2 m
 Tank bund level (TBL) = +14.50
 Side slopes of bund on either side = 2:1
 Design saturation gradient with 1 m clear cover = 4:1
 Level of hard strata = +9.50
 Ryve's coefficient for combined catchment = 9
 Ryve's coefficient for intercepted catchment = 1.5
 Provision may be made to make Kutcha regulating arrangements to store water upto MWL in times of necessity. (25 Marks)
- Draw:
- i) Half plan at foundation and half plan at ground level. (20 Marks)
 - ii) Draw half longitudinal section and half longitudinal elevation. (15 Marks)
 - iii) Cross section across surplus weir. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

5 Design a canal drop of 2 metres with following data:

Hydraulic particulars of canal above drop.

Full supply discharge	= 4 cumecs
Bed width	= 6 m
Bed level	= +10.00 m
Full supply depth	= 1.5 m
Full supply level (FSL)	= +11.50
Top width of bank	= 2 m
Top bank level (TBL)	= +12.50 m
Half supply depth	= 1 m

Hydraulic particulars of canal below drop.

Full supply discharge	= 4 cumecs
Bed width	= 6 m
Bed level	= +8.00 m
Full supply depth	= 1.5 m
Full supply level (FSL)	= +9.50 m
Top width of bank	= 2 m
Top bank level (TBL)	= +10.50 m
Ground level at site of work	= +10.50 m
Good soil available for foundation is at	= +8.50 m

(25 Marks)

Draw:

- Half plan at foundation and half plan at ground level.
- Longitudinal section.
- Cross section showing half elevation and half section.

(20 Marks)

(15 Marks)

(10 Marks)

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Sixth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Traffic Engineering

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Explain the road user characteristics that affects safety operation of vehicles. (10 Marks)
- b. In a braking test, a vehicle travelling at a speed of 30kmph was stopped by applying brakes fully and the skid marks were 5.8m in length. Determine the average skid resistance of pavement surface. (10 Marks)
- 2 a. Define the term “spot speed study”, with neat sketch. Explain enoscope method of determination of speed study. (10 Marks)
- b. The table below gives the consolidated data of spot speed studies in a section of a road. Determine the most preferred speed at which maximum proportion of vehicles travels.

Speed range (kmph)	No. of speed observations
0 – 10	0
10 – 20	11
20 – 30	30
30 – 40	105
40 – 50	233
50 – 60	216
60 – 70	68
70 – 80	24
80 – 90	0

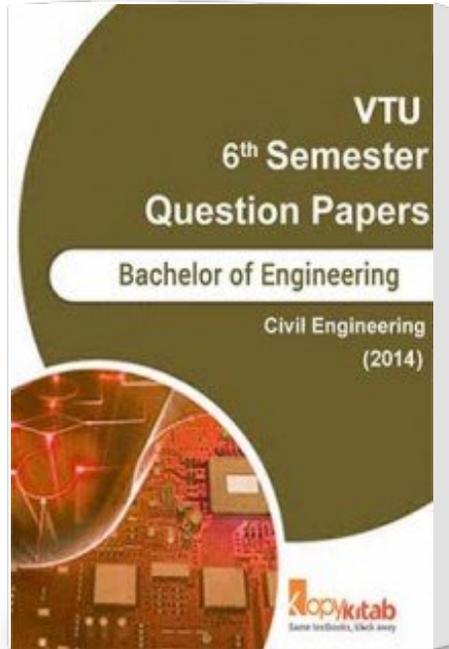
(10 Marks)

- 3 a. Define the term O – D study. Mention the various applications of O – D studies. (10 Marks)
- b. Define the terms: i) Possible capacity; i) Practical capacity. Mention the various factors that affect practical capacity. (10 Marks)
- 4 a. Mention the various causes of accidents. Explain each of them. (10 Marks)
- b. A vehicle of weight 2 tonnes skids through a distance equal to 40m colliding with another parked vehicle of weight 1.0 tonne. After collision both the vehicles skid through a distance equal to 12m before stopping. Compute the initial speed of moving vehicle. Assume coefficient of friction as 0.50. (10 Marks)

PART – B

- 5 a. Mention the various assumptions made in queuing approach as applied to traffic flow. (10 Marks)
- b. The off-peaks traffic flow arriving at random at toll both facility is 90 vehicles per hour, and peak flow is 180 vehicles per hour. The service rate exponentially distributed at the booth is 3.50 per minute. What is the average number of customers in the queue for each flow? (10 Marks)

VTU QUESTION PAPERS 6th Semester Civil 2014



Publisher : Faculty Notes

Author : Panel of experts

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