



*Knowledge Resource & Relay Centre (KRRC)*

AIKTC/KRRC/SoET/ACKN/QUES/2018-19/

Date: \_\_\_\_\_

School: SoET-CBCS

Branch: CIVIL ENGG.

SEM: VI

To,  
 Exam Controller,  
 AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following <sup>✓</sup>Semester/<sup>✓</sup>Unit Test-I/Unit Test-II (Reg./ATKT) question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Geotechnical Engg.-II	CE-C601		✓	02
2	Design & Drawing Of Steel Structure	CE-C602		✓	02
3	Transportation Engg. – II	CE-C603		✓	02
4	Environmental Engg – II	CE-C604		✓	02
5	Water Resource Engineering-I	CE-C605		✓	02
6	Department Level II-Optional Course <i>Advanced construction equipments</i>	CE-C606		✓	02
7	Software Applications in Civil Engineering				

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)  
 Librarian, AIKTC

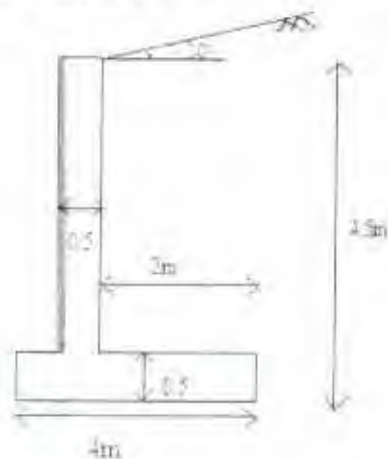
(3 Hours)

Max Marks: 80

- Note 1. Attempt any four of six questions  
 2. Question 1 is compulsory  
 3. Assume any suitable data where ever required

- Q.1 Attempt any four
- In a laboratory consolidation test, the void ratio of samples reduced from 0.85 to 0.73 as the pressure was increased from 1 to 2 kg/cm<sup>2</sup>. If the permeability of soil be 3.3 × 10<sup>-7</sup> cm/s find (i) coefficient of volume change (ii) coefficient of consolidation **05**
  - Derive the relation between principal stresses at failure in soil mass on the basis of Mohr-Coulomb criteria of failure **05**
  - Derive the expression for factor of safety in infinite slopes for dry, submerged and steady seepage condition for Cohesionless soil **05**
  - A 6m high vertical wall supports a saturated cohesive backfill ( $\phi=0$ ) with horizontal surface. The top 3m of backfill weights 18 kN/m<sup>3</sup> and has apparent cohesion 10 kN/m<sup>2</sup>. And the density and cohesion for bottom 3m of the backfill 20 kN/m<sup>3</sup> and 24 kN/m<sup>2</sup> respectively. Draw the pressure distribution diagram before formation of tension crack **05**
  - Explain the assumptions and failure zones described by Terzaghi for shallow foundation **05**
  - A 12m long and 300mm diameter concrete pile is driven in a uniform deposit of sand  $\gamma_s=18$  kN/m<sup>3</sup>  $N_q=137$ . calculate the load capacity of pile assume critical depth as 15 times the diameter of pile given  $k_p=2.0$  **05**
- Q.2
- A 2m thick layer of saturated clay lies in between two permeable layers. The clay has the following properties  $w_L=45\%$  coefficient of permeability  $2.8 \times 10^{-7}$  cm/s, initial void ratio is 1.25 and initial effective over burden pressure at the middle of clay layer 2 kg/cm<sup>2</sup> and is likely increase to 4 kg/cm<sup>2</sup> due to construction of new building  
 Determine (1) final void ratio of clay (2) settlement of proposed building (3) time required for 50% consolidation **10**
  - Explain the shear strength characteristics of sands in respect to stress-strain and volumetric changes. **05**
  - Briefly explain UU Strength for fully and partially saturated soils **05**
- Q.3
- An unconfined compression test was performed on a undisturbed sample of normally consolidated clay, having a diameter of 3.75cm and 7.5cm height. Failure occurs under a vertical compressive load of 116.3kg. The axial deformation recorded at failure was 0.9cm. A remolded sample of same soil failed under a vertical compressive load of 68.2kg and corresponding axial deformation was 1.15cm. Find unconfined compressive strength and cohesion of soil in undisturbed and remolded state. Also determine sensitivity of soil and classify accordingly **10**
  - Define (a) Coefficient of compressibility (b) Degree of consolidation (c) Compression index (d) Coefficient of consolidation (e) Over consolidation ratio **05**
  - Mention any two causes of preconsolidation of soil and describe the graphical method for finding preconsolidation pressure. **05**

- Q.4 a. A cut has to be made 6.5m deep, inclined at an angle  $35^\circ$  to the horizontal. The possible slip surface has a radius equal to 13.5m, and passing through the toe of cut slope and through the point 3 m away on the top ground from the edge of cut. The C.G. of failure mass is 6m from the centre of failure circle. The properties of soil are  $C=30\text{ kN/m}^2$ ,  $\phi=15^\circ$  has  $\gamma=2.0\text{ t/m}^3$ . Find the factor of safety that would be available in slip surface. Use friction circle method 10
- b. What is group capacity of piles and mention how the allowable load is found from pile load test for single and group piles 05
- c. Derive the expression for Rankine's active earth pressure for Cohesionless backfill 05
- Q.5 a. Check the stability of Concrete retaining wall with Cohesionless backfill having  $\gamma=18\text{ kN/m}^3$ ,  $\phi=38^\circ$  and wall friction  $25^\circ$  10



- b. Explain the limitations of pile load test 05
- c. Derive the expression for Taylor's stability number and explain the uses of it. 05
- Q.6 a. A rectangular footing 4m wide and 6m long transmits the load of column at a depth of 1.5m. calculate the safe load which the footing can carry using Vesic's method given  $C=20\text{ kN/m}^2$ ,  $\phi=30^\circ$ ,  $\gamma=18\text{ kN/m}^3$ ,  $N_c=30.1$ ,  $N_q=18.38$ ,  $N_{\gamma}=15.64$  10
- b. A square group of friction piles 16 in number each of 0.5m diameter are installed @ 1.5m center to center in a uniform clay stratum of 16m deep. The depth of piles extends to 12m below surface. The average unconfined compressive strength of clay is  $80\text{ kN/m}^2$ . The clay has  $w_L=56\%$ . (i) calculate the allowable load taking F.S as 3 10
- (ii) Determine the settlement of pile group at that load  $\gamma=1.8\text{ t/m}^3$ ,  $G=2.6$ ,  $e=0.65$  and adhesion factor as 0.45

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T-E - Sem - VI - Choice Based - (Civ)

16/5/19

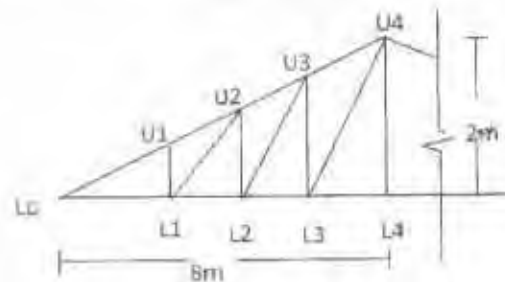
Paper / Subject Code: 88882 / Design and Drawing of Steel Structure

Time: 4 Hours

Total Marks: 80

- N.B. 1) Question No 1 is compulsory.  
2) Solve any **three** questions from remaining questions.  
3) Assume suitable data if required but justify same.  
4) Use of IS 800 and steel table is permitted in the examination hall.  
5) Figures to the right indicate full marks.

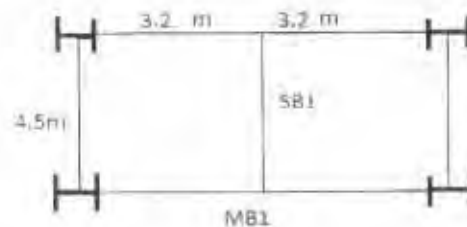
- Q.1 (a) A truss as shown in fig. is used for an industry situated in Mumbai. The truss is covered with AC sheet  $171 \text{ N/m}^2$ . Calculate panel point dead load, live load and wind load. Design the members LoL1, LoU1 and U1L1 and draw the design details Assume  $K1 = 1$ ,  $K2 = 0.99$ ,  $(Cpe - Cpi) = -0.9$ ,  $k3 = 1$ , self-weight of purlin is  $200 \text{ N/m}$  and spacing of truss is  $3 \text{ m}$ . 26



- (b) Design the channel section purlin for the above truss. 6

OR

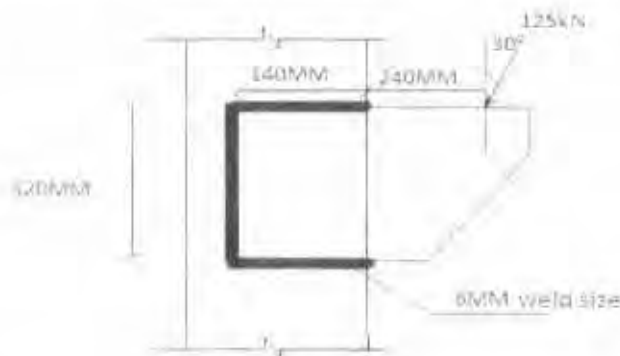
- Q.1 (a) The flooring system of an industrial shed is planned as shown in fig Design Beam SB1 And MB1 26  
And a beam to beam connection between them with top flange of beam at same level. Use ISLB or ISMB section to design beam assuming beam to be laterally supported throughout for the following data.  
Thickness of slab -  $150 \text{ mm}$   
Thickness of wall  $230 \text{ mm}$ , height of wall is  $1.5 \text{ m}$  on all beams.  
Live load is  $2 \text{ kN/m}^2$ , floor finish load is  $0.75 \text{ kN/m}^2$   
Unit weight of concrete and wall  $25 \text{ kN/m}^3$  and  $20 \text{ kN/m}^3$  respectively.



- (b) Design the bolted connection between MB1 and column flange using 4.6 grade bolts. Sketch the connection details. 6

**Paper / Subject Code: 88882 / Design and Drawing of Steel Structure**

- Q.2 (a) A column ISHB 350 at 601.2 N/m carries compressive factored load is 1660kN. Design suitable bolted gusset base. The base rests on M15 grade concrete pedestal. Use 24mm diameter bolts of grade 4.6 for making the connection. The SBC of soil is 150kn/m<sup>2</sup>. 12
- Sketch plan, elevation and side view of the gusseted base you designed. 4
- (b) Write step by step procedure to design slab base. 4
- Q.3 (a) Design built up column using batten system 9m long to carry a factored axial load of 1300 kN. column is fixed at both ends. Assume that two channels are kept back to back. Use 4.6 grade bolts for the connection. Draw the neat sketch to show details of the design. 14
- (b) Estimate the design load for the column in Q3(a) if lacing system is used. 2
- Q.4 Design a welded plate girder 18 m in span and laterally supported throughout. It has to support UDL of 85 kN/m throughout the span exclusive of self weight. Assume the steel is of grade Fe-410. Also design the connections between web and flange plate. Design central section of the plate girder for bending and shear. Also design two step curtailment for flange plates. Sketch the plan, elevation and section of the plate girder. 16
- Q.5 (a) For the connection as shown in fig if the load is 100 kN inclined at 30° to the vertical in clockwise direction. Check whether the fillet weld is safe. Assume that field weld is used. 8



- (b) A simply supported steel joist of 5m span has to support a load of 60kN/m (inclusive of self-weight). The beam compression flange is not restrained against buckling. Design an appropriate section using steel of grade Fe-410. 8

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(3Hours)

Total marks=80

- Note**
1. Question No 1 is compulsory.
  2. Attempt Any 3 out of remaining
  3. Assume any suitable data wherever required.

**Q.1**

- a.
  - i. \_\_\_\_\_ is used for servicing and repairs of the aircraft 10
  - ii. The runway length after correcting for elevation and temperature is 2845m. If the effective gradient on runway is 0.5% then the revised runway length will be \_\_\_\_\_
  - iii. Distance between inner faces of the flanges, is kept slightly less/ equal/ more than gauge distance.
  - iv. Bearings are provided in bridges to \_\_\_\_\_
  - v. Every port is a harbor. True / False
- b. Explain Negative Super elevation by a neat sketch. 5
- c. As per ICAO classify various types of airports? Enlist some of the Airports in India 5

**Q.2**

- a. What is ballast? Why is it used in the railway track? Briefly describe the various types of ballast used? 10
- b. Design the Exit runway joining a runway and a parallel main taxiway. The total angle of turn is  $35^\circ$  and the maximum turn-off speed is 80 Kmph 10

**Q.3**

- a. Explain the different types of Railway yards and their functions with neat diagrams. 10
- b. Design a turnout of 1 in 8.5 for a BG track assuming the curve is tangential to tongue rail, it springs up from the heel of switch at  $1^\circ 8' 0''$  and ends TNC. Assume heel divergence = 13.3 cm 10

**Q.4**

- a. The length of runway under standard condition is 2100m. It is to be at elevation of 410 mts above the M.S.L. The ART is  $32^\circ$  C. The construction plan provides the following data .Calculate the corrected length. Also apply check 10

End to End runway (m)	0-300	300-900	900-1500	1500-1800	1800-2100	2100-2700	2700-3000
Grade %	+1.0	-0.50	+0.50	+1.00	-0.50	-0.04	-0.10

- b. Explain in detail Airport obstructions with neat sketches? 10

**Q.5**

- a. What would be the Equilibrium Cant on BG track of  $7^\circ$  for an average speed of train 80 kmph? Also calculate the maximum permissible speed after allowing the maximum cant deficiency? 10
- b. Explain the working of Semaphore Signals with neat sketch 10

**Q.6**

- a. Explain Wind rose diagram? What is its utility and its types? Explain each type with neat sketches? 10
- b. Define Breakwaters and mention various breakwater 5
- c. Describe with neat sketch (i) Diamond crossing (ii) cross over 5

(Time: 3 Hours)

[Total Marks: 80]

- N.B:** 1. Question No.1 is compulsory  
 2. Attempt any **three** questions from remaining **five** questions.  
 3. Assume any suitable data where ever required.  
 4. Figures to the right indicate full marks.

**Q.1** Attempt any **four**

- |    |  |    |
|----|--|----|
| a. | Differentiate between combined and separate system of sewerage.  | 05 |
| b. | Draw neat sketch of inverted siphon.   | 05 |
| c. | A 3% solution of sewage sample is incubated for 5 days at 20°C. The depletion of oxygen was found to be 3ppm. Determine the BOD of raw sewage. | 05 |
| d. | Define F/M and Sludge age  | 05 |
| e. | Why oil and grease should be removed from waste water? Draw neat diagram of skimming tank.   | 05 |

- |            |    |  |    |
|------------|----|--|----|
| <b>Q.2</b> | a. | Describe the procedure for laying and testing of sewers.   | 10 |
|            | b. | State the routine tests carried out in the laboratories at sewage treatment and disposal works and explain the significance of each of them. | 10 |

- |            |    |   |    |
|------------|----|---|----|
| <b>Q.3</b> | a. | What do you understand by self-purification property of a stream? Explain the factors affecting this property.  | 10 |
|            | b. | Design a high rate single stage trickling filter for treating the following wastewater of a town having a population of 40,000 persons:<br>a) Domestic sewage @ 150 lpcd having 200mg/lit of BOD<br>b) Industrial wastewater @ 0.25 million litres per day having 600mg/lit of BOD. | 10 |

Assume the following:

- i) BOD removal in primary clarifier = 35%
- ii) Permissible organic loading of filter = 8000 kg/hect-m/day (excluding recirculated sewage)
- iii) Recirculation ratio = 1.0
- iv) Permissible surface loading = 160 ML/hect/day (including recirculated sewage)

Also, Determine the efficiency of the filter.

- |            |    |   |    |
|------------|----|---|----|
| <b>Q.4</b> | a. | Enumerate the various methods which can be used for disposal of municipal solid waste and explain the two most widely adopted in India. | 10 |
|            | b. | Differentiate between single pipe and single stack plumbing system with neat sketch.  | 10 |

- Q.5 a. Explain the working of Activated Sludge Process with neat sketch. Discuss the role of return sludge. 10
- b. Design the dimensions of a septic tank for the following data: 10
- No. of People=150  
Sewage/capita/day=130lit  
Desludging period=2years  
Length: Width =4:1
- Q.6 Write short note on (any four) 20
- a. Sludge thickener  
b. Oxidation ditch  
c. Recycling and reuse of waste water  
d. Constructed wetland  
e. Pumping station

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2/6/19

(Time: 3 hours)

Total marks: 80

- N.B:** (1) Question no. 01 is compulsory.  
 (2) Attempt any 3 questions out of the remaining 5 questions.  
 (3) Assume data wherever necessary and clearly mention the assumption made.  
 (4) Draw neat figures as required.

**Q1:- Attempt Any Four (20)**

- a) Define irrigation and discuss in brief the benefits and ill effects of irrigation.
- b) Write a note on sub surface irrigation, stating clearly the conditions under which this method is suitable.
- c) What are the factors affecting duty?
- d) Explain hydrologic cycle with neat sketch.
- e) State and discuss assumptions and limitations of Dupuit's theory.
- f) Write short note on reservoir sedimentation.

**Q2:-**

- a) i) Describe the salient features of National Water Policy 1987. (05)  
 ii) What are the advantages and disadvantages of Bandhara irrigation (05)
- b) Discuss in brief various methods of surface irrigation. (10)

**Q3:-**

- a) i) Define the term duty and derive the relationship between duty delta and base period. (05)  
 ii) What do you understand by crop rotation? What are its advantages. (05)
- b) The base period, intensity of irrigation and duty of water for various crops under the canal system are given. Determine the reservoir capacity, if the culturable command area is 40000 hectares, canal losses are 25% and reservoir losses are 15%. (10)

Crop	Base period(days)	Duty at field (Ha/cumec)	Intensity of irrigation
Wheat	120	1800	25%
Sugarcane	360	1700	20%
Cotton	180	1400	10%
Rice	120	800	15%
Vegetables	120	700	15%

**Q4:-**

- a) Describe various methods of computing average rainfall over a basin. (10)
- b) Find out the ordinates of a storm hydrographs resulting from a 3 hour storm with rainfall 3, 4.5 and 1.5 cm during subsequent 3 hour intervals. The ordinates of unit hydrograph are given in the table below. (10)

Hours	0	3	6	9	12	15	18	21	24	27	30	33	36
Ordinates of unit hydrograph (cumecs)	0	90	200	350	450	350	260	190	130	80	45	20	0

Assume an initial loss of 5mm, infiltration index of 5mm / hour and base flow of 20 cumecs

Q5:-

- a) i) Derive an expression for discharge from a well fully penetrating a confined aquifer. (05)  
 ii) Define aquifer, aquiclude, specific yield, specific retention and perched aquifer. (05)
- b) A 30 cm diameter well penetrates 25 m below the static water table. After 24 hours of pumping at the rate of 5400 liters/minutes, the water level in a test well at 90 m is lowered by 0.53 m, and in a well 30 m away the drawdown is 1.11 m. (10)  
 i) What is the transmissibility of the aquifer?  
 ii) Also determine the drawdown in main well.

Q6:-

- a) i) State the factors affecting selection of site of a reservoir. (05)  
 ii) Discuss various zones of storages with neat sketch. (05)
- b) Fix the control levels of a medium size reservoir from the following data. (10)  
 i) Effective storage required for crops = 32 Mm<sup>3</sup>  
 ii) Tank losses = 20% of effective storage  
 iii) Carry over allowance = 10% of effective storage.  
 iv) Dead storage = 10% of gross storage.  
 v) Length of waste weir = 100m  
 vi) Maximum flood discharge = 500 cumec.  
 vii) Francis formula  $Q = 1.84 LH^{3/2}$   
 viii) Wind velocity  $V = 70$  KMPH.  
 ix) Fetch length  $F = 30$  KM.

Contour RL(m)	250	253	256	-	278	281	284
Storage (Mm <sup>3</sup> )	3.3	4.1	5.25	-	42.65	47.3	55.12

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(3 hours)

Marks: 80

N.B.

1. Question No 1 is compulsory
2. Attempt any three questions from the remaining five questions
3. Figures to the right indicate full marks

Q1. Solve all the questions.

- |     |  |    |
|-----|--|----|
| a.  | Classify construction equipment and its important role in construction industry  | 05 |
| b.  | Explain modern and conventional type of formwork.  | 05 |
| c.  | What is the purpose and types of tunnels? Explain factors to be considered during tunneling in hard and soft rocks.                              | 05 |
| d.  | Enlist and explain the Dewatering technique for trench   | 05 |
| Q2. | a. Enlist the Equipment's involved in the construction of Metro Project. What construction techniques are used for setting up the metro station. | 10 |
|     | b. Enlist the different types of Drilling Equipment . Explain any one in detail with neat sketch.  | 10 |
| Q3. | a. What is TBM. Enlist all parts of TBM. Explain working and function of TBM.  | 10 |
|     | b. Enlist & explain the Factor affecting the performance of pumping equipment's  | 10 |
| Q4. | a. Enlist the Equipments required for the construction of roads using paver machines. Explain the process in detail.                             | 10 |
|     | b. Enlist & Explain the Equipment Required for the construction of airport. Explain stage wise construction and equipment list.                  | 10 |
| Q5. | a. Enlist & Explain the Equipment Required for the construction of Hydropower station.   | 10 |
|     | b. Explain the Construction of railway lines using track laying machine in detail. Also enlist other equipment's required.                       | 10 |
| Q6. | Write short notes on (any four)  |    |
| a.  | Mivan technique of formwork  | 05 |
| b.  | Power shovel   | 05 |
| c.  | GPR system   | 05 |
| d.  | Tower Crane  | 05 |
| e.  | Types of pile driving equipments   | 05 |
| f.  | Hoisting Equipments  | 05 |