CIVIL ~~VII~~ CBC VI Sem / Civil 10/5/2019

Paper / Subject Code: 36701 / GEOTECHNICAL ENGINEERING -II

(3 Hours) **Marks : 80**

te: 1. Question No. 1 is compulsory
2. Attempt any 3 out of five questions
3. Assume any suitable data where ever required
4. Figures to the right indicate the full marks

1 a. Write the measures to avoid the failures of finite and infinite slope 05

b Write a short note on imperfect ditch conduit 05

c. Explain the negative skin friction. 05

d. A footing is resting on sandy soil, show it by calculation that if water table is going to rise up to ground surface, the bearing capacity reduces to 50%. 05

2 a. Explain the method of slices for computing factor of safety. Write the stepwise procedure supported by clear diagrams. 10

b. Describe briefly Rebhann's graphical method for determining total active earth pressure. 07

c. Write the limitations of dynamic methods for computation of pile capacity. 03

3 a. A retaining wall 6 m height retains cohesive soil with c = 10 kN/m^2, $\phi = 10^0$, and γ = 20 kN/m^3 up to a depth of 3 m from top. From 3 to 6 m the soil is the sandy with $\phi = 30^0$ and saturated unit weight of 24 kN/m^3. The water table is at 3 m below ground level and uniform surcharge of 12 kN/m^2 acts on the top of soil. Draw the active earth pressure diagram detailing the values at the critical points. Also calculate the resultant thrust on the wall 10

b. Derive the expression for factor of safety for an infinite slope made of cohesionless soil for the condition of seepage occurring parallel to slope. 05

c. Explain the ditch and projection condition with diagram. 05

4 a. The detail of a sheet pile wall is given as below: 10

The height of wall projecting above dredge level is 6 m and water table is at 2.5 m below top surface. The top surface is horizontal. Soil properties above water table are γ = 18.5 kN/m^3, ϕ = 30°, below water table are : γ_{sat} = 21.5 kN/m^3, ϕ = 30°, and below dredge level are : γ_{sar} = 22 kN/m^3, ϕ = 0°, c = 50 kN/m^2. Compute the depth of embedment.

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b. Find the forces in 3 struts located at depths 1 m, 2.5 m, and 4 m from the top of the cut for a bracing system provided to support an open cut of 5 m depth in a clayey soil. The properties of soil are γ = 17 kN/m^3, c = 22 kN/m^2, the centre to center spacing along the length of the cut is 2.5 m.

Q.5 a. Calculate the safe bearing capacity of a square footing 2 m × 2 m in plan founded at a depth of 1.5 m below ground level. The unit weight of soil is 19 kN/m^3 and effective shear strength parameters are c = 18 kN/m^2 ϕ = 30^0. The natural water table is at a depth of 1.5 m below ground level. Use Vesic's method, the bearing capacity factors are given as N_c = 30.1, N_q = 18.4, N_γ = 22.4. Use factor of safety as 2.5.

b. Write a note on critical depth of pile and adhesion factor.

c. Explain how to improve the stability of slope using geogrid material.

Q.6 a. A pile group of 16 piles of 550 mm diameter is arranged in square pattern with centre to centre spacing of 1.1 m. The piles are 10 m long and are embedded in soft clay soil with cohesion of 28 kN/m^2. Take adhesion factor as 0.6. Determine the ultimate capacity of pile group.

b A strip footing is kept on ground surface and subjected a load of 200 kN/m. The value of factor of safety is 2. Determine the size of footing. Take γ = 18 kN/m^3, N_q = 22.5, and N_γ = 19.7. Use Terzaghi Analysis.

c. Write a note on reinforcing elements.

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CIVIL/VI/2BC

10/5/2019

Paper / Subject Code: 88881 / Geotechnical Engineering - II

(3 Hours) **Max Marks: 80**

. Attempt any 4 out of six questions
. Question 1 is compulsory
. Assume any suitable data where ever required

Attempt any four

a. 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^2. If the permeability of soil be 3.3×10^{-4}cm/s find (i) coefficient of volume change (ii) coefficient of consolidation **05**

b Derive the relation between principal stresses at failure in soil mass on the basis of Mohr-coulomb criteria of failure **05**

c. Derive the expression for factor of safety in infinite slopes for dry, submerged and steady seepage condition for Cohesionless soil **05**

d. A 6m high vertical wall supports a saturated cohesive backfill (ϕ=0) with horizontal surface. The top 3m of backfill weights 18 kN/m3 and has apparent cohesion 18 kN/m2. And the density and cohesion for bottom 3m of the backfill 20 kN/m3 and 24 kN/m2 respectively. Draw the pressure distribution diagram before formation of tension crack **05**

e. Explain the assumptions and failure zones described by Terzaghi for shallow foundations **05**

f. A 12m long and 300mm diameter concrete pile is driven in a uniform deposit of sand γ_d=18kN/m^3 N_q=137.calculate the load capacity of pile assume critical depth as 15 times the diameter of pile given k_s=2.0 **05**

a. 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 2.8×10^{-7}cm/s, initial void ratio is 1.25 and initial effective over burden pressure at the middle of clay layer 2 kg/cm^2 and is likely increase to 4 kg/cm^2 due to construction of new building **10**
Determine (1) final void ratio of clay (2) settlement of proposed building (3) time required for 50% consolidation

b. Explain the shear strength characteristics of sands in respect to stress-strain and volumetric changes. **05**

c. Briefly explain UU Strength for fully and partially saturated soils **05**

a. 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**

b. Define (a) Coefficient of compressibility (b) Degree of consolidation (c) Compression index (d) Coefficient of consolidation (e) Over consolidation ratio **05**

c. Mention any two causes of preconsolidation of soil and describe the graphical method for finding preconsolidation pressure. **05**

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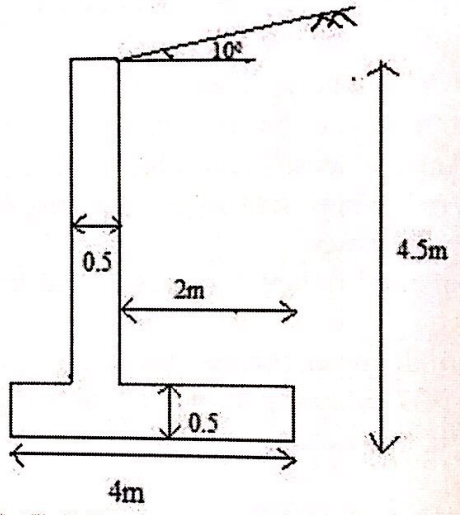
Q.4 a. A cut has to be made 6.5m deep, inclined at an angle 35^0 to the horizontal. The possible slip surface has a radius equal to 13.5m, and passing through the toe of cut slope and through the point 3 m away on the top ground from the edge of cut. The C.G of failure mass is 6m from the centre of failure circle. The properties of soil are C=30 kN/m², $\phi=15^0$ has γ=2.0 t/m3. Find the factor of safety that would be available in slip surface. Use friction circle method

b. What is group capacity of piles and mention how the allowable load is found from pile load test for single and group piles

c. Derive the expression for Rankine's active earth pressure for Cohesionless backfill

Q.5 a. Check the stability of Concrete retaining wall with Cohesionless backfill having γ=18 kN/m³ $\phi=38^0$and wall friction 25^0



b. Explain the limitations of plate load test

c. Derive the expression for Taylor's stability number and explain the uses of it

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 kN/m² $\phi=30^0$ γ=18 kN/m³ N_c=30.1,N_q=18.38, N γ=15.64

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 80kN/m². The clay has w_L=56%. (i) calculate the allowable load taking F.S as 3
(ii) Determine the settlement of pile group at that load γ=1.8 t/m³ G=2.6 , e=0.65 and adhesion factor as 0.45

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1 (f) **take angle of internal friction as 40.**

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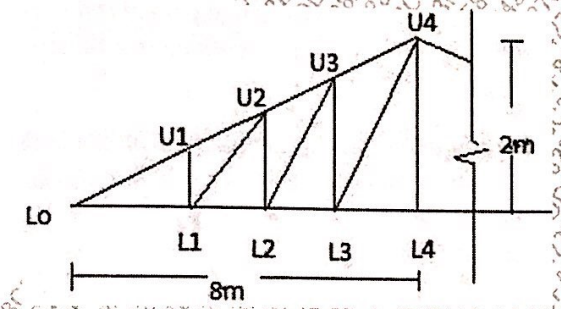
81 - Geotechnical Engineering - II QP Code: 69088



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

OR

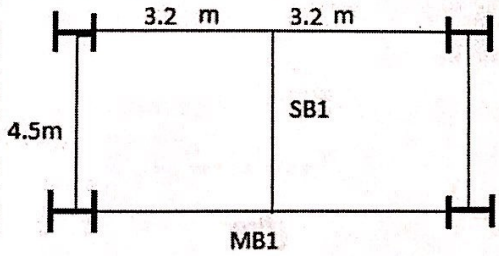
(a)The flooring system of an industrial shed is planned as shown in fig Design Beam SB1 And MB1 And a beam to beam connection between them with top flange of beam at same level. Use ISLB or ISMB section to design beam assuming beam to be laterally supported throughout for the following data. 26

Thickness of slab - 150mm

Thickness of wall 230mm, height of wall is 1.5m on all beams.

Live load is 2 kN/m^2 ,floor finish load is 0.75kN/m^2

Unit weight of concrete and wall 25kN/m^3 and 20kN/m^3 respectively.



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

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CIVIL / VI / CBC

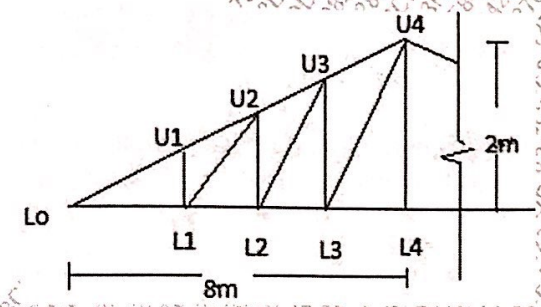
16/5/2019

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

me: 4 Hours | Total Marks: 80

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.

(a) A truss as shown in fig. is used for an industry situated in Mumbai. The truss is covered with AC sheet 171 N/m². 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 200N/m and spacing of truss is 3m. **26**

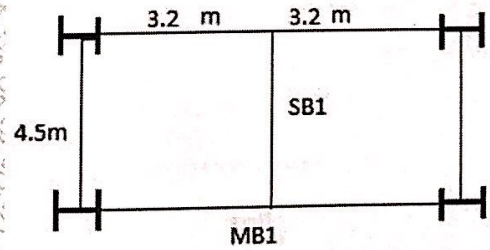


(b) Design the channel section purlin for the above truss. **6**

OR

(a)The flooring system of an industrial shed is planned as shown in fig Design Beam SB1 And MB1 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. **26**

Thickness of slab - 150mm
Thickness of wall 230mm, height of wall is 1.5m on all beams.
Live load is 2 kN/m² ,floor finish load is 0.75kN/m².
Unit weight of concrete and wall 25kN/m³ and 20kN/m³ respectively.



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

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Q.2 (a) A column ISHB 350 at 661.2 N/m carries compressive factored load is 1660kN. Desig bolted gusset base. The base rests on M15 grade concrete pedestal. Use 24mm diameter b grade 4.6 for making the connection .The SBC of soil is 150kn/m^2.

Sketch plan, elevation and side view of the gusseted base you designed.

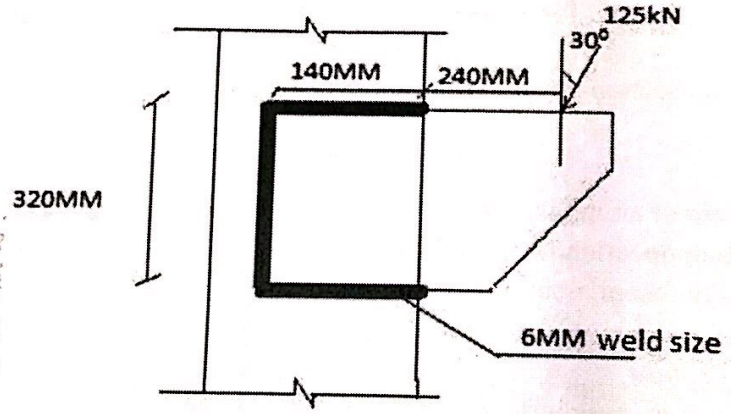
(b) Write step by step procedure to design slab base.

Q.3 (a) Design built up column using batten system 9m long to carry a factored axial load of column is fixed at both ends .Assume that two channels are kept back to back. Use 4.6 gra for the connection. Draw the neat sketch to show details of the design.

(b) Estimate the design load for the column in Q3(a) if lacing system is used.

Q.4 Design a welded plate girder 18 m in span and laterally supported throughout. It has to su of 85 kN/m throughout the span exclusive of self weight. Assume the steel is of grade Fe design the connections between web and flange plate. Design central section of the plate bending and shear .Also design two step curtailment for flange plates. Sketch the plan,ele section of the plate girder.

Q.5 (a) For the connection as shown in fig if the load is 100 kN inclined at 30^0 to the vertical clockwise direction Check whether the fillet weld is safe. Assume that field weld is used.



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

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CIVIL/VI/CBC DDSS 16/5/2019

Paper / Subject Code: 36702 / DESIGN AND DRAWING OF STEEL STRUCTURE

Q.P.Code: 016950

(4 Hr) **Maximum Marks – 80**

B. 1. Question **No. 01 is compulsory**, attempt any **three** out of remaining three questions
2. Draw neat and proportionate **sketches** whenever necessary.
3. Use of **IS 800 and steel table** is permitted.
4. Assume **suitable data** if necessary and justify the same.
5. Use steel of **Grade Fe410** and bolt of **grade 4.6**

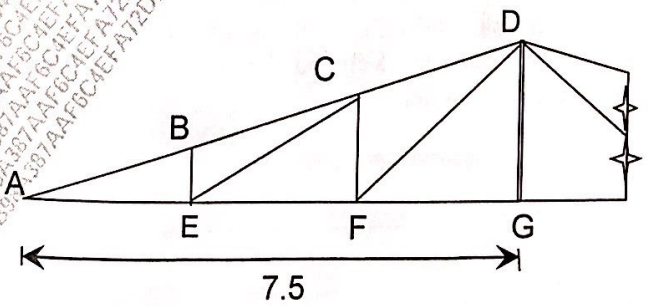
.1 A flooring system is proposed for a small warehouse with size 6.2x4.2m as shown in fig. Design Beam SB1 and MB2, Also design a beam to beam connection between these two beam to transfer reaction of **SB1 to MB2** assuming that all beams are laterally supported throughout and top flanges are at same level, **32**

-All beam supports load of parapet wall of height-1.2m
-thickness of wall - 220 mm
-thickness of concrete slab - 180mm
- Unit weight - (Concrete-25 N/mm^2, Brick Wall - 19 N/mm^2)

OR

Design members AB, BC, AE, EF, BE and CF, considering structure to be installed in the vicinity of Mumbai. Find panel point load for given truss for DL, LL and WL and draw the same. **32**

For the calculations of wind load consider,
values of $K_1 = 1.0$, $K_2 = 0.98$, $K_3 = 1.0$ and $(C_{pe} - C_{pi}) = -0.5$,
-weight of AC sheets - 170 N/m^2
-Self weight of Purlin - 250 N/m
-Spacing between trusses - 4m, Rise of truss – 1/5
-Span of truss - 15m



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Q.2 a) Design a column with roller steel **single I-Section** to carry factored load of 800 kN, with effective length of 4.23m

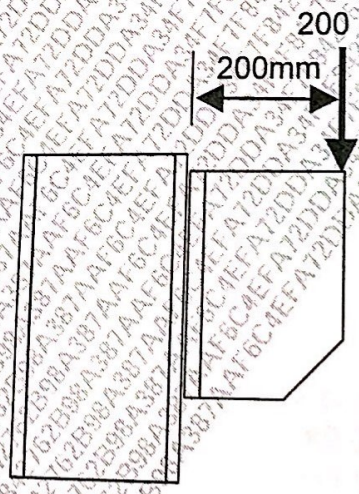
b) Design a **built -up column** of height 6 m with two channel section placed back to back to carry factored axial load of 1800 kN with one end fixed and other rolled. Design a column using single lacing system and draw neat diagram.

Q.3 a) Write a note on web buckling and web crippling

b) Design a **gusseted base** with bolted connection to carry load equal to design capacity of the column. The column is consist of ISHB 300@576.83 N/m with cover plate 300x20 mm on each flange. Determine size and thickness only for bolted gusset base assuming bearing pressure of concrete 10 N/mm^2.

Q.4 a) Calculate design **bending strength (M_d)** for laterally unsupported beam ISLB 400@ 558.19 N/m for length 3.2m by using IS code table, also determine amount of UDL that can be carried by beam safely.

b) **Design a bracket connection** to transfer end reaction of 200kN due to factored load. The load is acting at an eccentricity of 200mm from the flange of column. Design bolted joint connecting T-Flange with column flange. Provide 20mm diameter of bolt.



Q.5 a) Design **welded plate girder** over a span of 20m to carry factored service UDL of 30kN/m excluding self-weight and a point load of 300 kN at mid-span. Design **plate girder** assuming $d/t_w = 120$, plate girder is laterally supported throughout and no intermediate stiffeners are provided.

- Design Cross Section, give check and draw neatly.
- Connection between web and flange
- Design end stiffeners

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rrection in 1T00616 - T.E.(CIVIL)(SEM VI) (CBSGS) (R-2012) / 36702 -
SIGN AND DRAWING OF STEEL STRUCTURE

Code: 16950

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rrection-01
ad -'Beam SB1 & **MB1'** instead 'Beam SB1 & **MB2'**

rrection - 2
t weight of (Concrete is 25 kN/m3 & 19kN/m3)
-Meter Cube)

16/05/19

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° 8' 0" and ends TNC. Assume heel divergence = 13.3. **10**

The length of runway under standard condition in 2100mt. It is to be at elevation of 410 mts above the M.S.L. The ART is 32° 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

Explain in detail Airport obstructions with neat sketches? **10**

What would be the Equilibrium Cant on BG track of 7^0 for an average speed of train 80 kmph? Also calculate the maximum permissible speed after allowing the maximum cant deficiency? **10**

Explain the working of Semaphore Signals with neat sketch **10**

Explain Wind rose diagram? What is its utility and its types? Explain each type with neat sketches? **10**

Define Breakwaters and mention various breakwater **5**

Describe with neat sketch (i) Diamond crossing (ii) cross over **5**

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CIVIL/VI/CBC 22/5/2019

Paper / Subject Code: 88883 / Transportatiion Engineering - II

(3Hours) **Total marks=80**

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

i. _____ is used for servicing and repairs of the aircraft **10**

ii. The runway length after correcting or 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

Explain Negative Super elevation by a neat sketch. **5**

As per ICAO classify various types of airports? Enlist some of the Airports in India **5**

What is ballast? Why is it used in the railway track? Briefly describe the various types of ballast used? **10**

Design the Exit runway joining a runway and a parallel main taxiway. The total angle of turn is 35^{0}C and the maximum turn-off speed is 80 Kmph **10**

Explain the different types of Railway yards and their functions with neat diagrams. **10**

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° 8' 0" and ends TNC. Assume heel divergence = 13.3 **10**

The length of runway under standard condition in 2100mt. It is to be at elevation of 410 mts above the M.S.L. The ART is 32^0 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

Explain in detail Airport obstructions with neat sketches? **10**

What would be the Equilibrium Cant on BG track of 7^0 for an average speed of train 80 kmph? Also calculate the maximum permissible speed after allowing the maximum cant deficiency? **10**

Explain the working of Semaphore Signals with neat sketch **10**

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Define Breakwaters and mention various breakwater **5**

Describe with neat sketch (i) Diamond crossing (ii) cross over **5**

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ortatiion Engineering - II
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CIVIL | VI | CBC

22/5/2019

Paper / Subject Code: 36703 / APPLIED HYDRAULICS-II

Q.P. Code : 16409

(CBGS)

(3 hours)

Total marks: 80

(1) Question no.1 is compulsory.

(2) Attempt any 3 questions out of the remaining 5 questions.

(3) Assume data wherever necessary and clearly mention the assumptions made.

(4) Draw neat figures as required.

Solve any four from the following 20

a Explain specific energy and specific energy curve with a neat sketch.

b Classify and draw different surface profiles of a mild sloped open channel.

c Enlist the drawbacks of Kennedy's theory.

d Explain terminal velocity with suitable examples.

e Explain boundary layer separation with a neat sketch.

a Prove that in a most economical trapezoidal channel section 10

(i) Half of the top width = one of the sloping sides.

(ii) The best side slope is 60^0 to the horizontal.

b. The triangular channel where depth of flow is 0.6 m and conveys a discharge of 0.285 m^3/s between elevations 300 m and 297 m. The channel is required to be the most economical one. For normal flow, what should be the length of the channel between these sections? Take N= 0.021. 10

a Derive an expression for the dynamic equation of gradually varied flow. State the assumptions. 10

b The loss of energy head in a hydraulic jump is 4.05 m. The Froude number just before the jump is 7.50. Find 10

(i) Discharge per meter width of channel.

(ii) The depth before and after hydraulic jump.

(iii) Froude number after jump.

(iv) Percentage loss of energy head due to the jump.

(v) Length of the jump.

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Q4 a Design a regime channel for a discharge of 50 cumecs with a silt factor 1 using Lacey's

b Compare Kennedy's and Lacey's theories. What are the drawbacks of Lacey's theory?

Q5 a Water is flowing over a thin smooth plate of length 4 m and width 2 m at a velocity m/s. If the boundary layer flow changes from laminar to turbulent at a Reynold's n $5x10^5$, find (i) the distance from leading edge of the plate upto which boundary laminar, (ii) the thickness of the boundary layer at the transition point and (iii) the dra on one side of the plate. Take viscosity of water $\mu = 9.81x10^{-4}$ Ns/m^2.

b Derive Von-Karman Momentum Integral equation.

Q6 a What is an airfoil? Explain airfoil terminologies with a neat sketch and prove that efficient of lift on an airfoil is dependent on the angle of attack.

b A kite 0.8m x 0.8m weighing 4.0 N assumes an angle of 12° to the horizontal. Th attached to the kite makes an angle of 45° to the horizontal. The pull on the string when the wind is flowing at a speed of 30 km/hour. Find the corresponding co-eff drag and lift. Density of air is given as 1.25 Kg/m^3.

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28/5/2019

Paper / Subject Code: 88884 / Environmental Engineering - II

(Time: 3 Hours) [Total Marks: 80

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.

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

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

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: 10
a)Domestic sewage@150 lpcd having 200mg/lit of BOD
b) Industrial wastewater @ 0.25million litres per day having 600mg/lit of BOD
Assume the following:
i)BOD removal in primary clarifier=35%
ii)Permissible organic loading of filter=8000kg/hec-m/day(excluding recirculated sewage)
iii)Recirculation ratio=1.0
iv)Permissible surface loading=160ML/hec/day(including recirculated sewage)
Also, Determine the efficiency of the filter.

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

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Q.5 a. Explain the working of Activated Sludge Process with neat sketch. Discuss the role of return sludge.

b. Design the dimensions of a septic tank for the following data:
No. of People=150
Sewage/capita/day=130lit
Desludging period=2years
Length: Width =4:1

Q.6 Write short note on **(any four)**

a. Sludge thickener
b. Oxidation ditch
c. Recycling and reuse of waste water
d. Constructed wetland
e. Pumping station

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28/5/2019

(3 Hours) [Total Marks 80]

ote: 1) Question no. **1** is compulsory.
2) Attempt any **three** questions out of the remaining **five** questions.
3) Clearly mention the assumptions made if any.
4) Use of Refrigerant Tables, P-h chart, Friction chart, Psychrometric Chart and Steam table is permitted.

1 Answer any **Four** of the following: **20**

List down the types of aircraft air cooling systems. Draw T-s Diagram for Simple Air Evaporative Cooling System

Draw VCR Cycle on P- h diagram with sub-cooling of liquid refrigerant in condenser & explain the processes involved in the cycle.

What is Bypass factor? Explain it for heating and cooling coil.

Define & explain RSHF, GHSF and ERSHF.

What is Human Comfort? Explain with the help of ASHRAE Comfort Chart.

In a refrigeration plant working on Bell-Coleman cycle, air is compressed to 5 bar from 1 bar. Its initial temperature is 10°C. After compression, the air is cooled upto 20°C in a cooler before expanding back to a pressure of 1 bar. Determine Theoretical COP & Net Refrigeration Effect of the plant. Take $\gamma = 1.4$ for air.

2 a) The following data refers to Simple Air Refrigeration Cycle of 20TR capacity.
Ambient air temperature & pressure = 20°C & 0.8 bar
Ram air pressure = 0.9 bar
Compressor outlet pressure = 3.6 bar
Temperature of air leaving H.E. = 60°C
Pressure of air leaving the turbine = 1 bar
Temperature of air leaving the cabin = 27°C
Compressor & Turbine efficiency = 80% & 75% respectively
Assume no pressure drop in H.E. & isentropic ramming process. Calculate;
(i) Mass of air circulated per minute.
(ii) Power required.
(iii) COP. **12**

Classify Ducts & derive an expression for an equivalent diameter of a circular duct for rectangular duct for same frictional loss per unit length when quantity of air flowing through both ducts is same. **08**

3 a) A Vapour Compression Refrigeration System using NH_3 works between -15°C and 40°C as evaporator and condenser temperature respectively. The vapour is superheated by 5°C before entering compressor & liquid is sub-cooled by 5°C before leaving the condenser. Using P-h chart, determine;
(i) COP
(ii) Mass of Refrigerant per TR
(iii) Piston Displacement per TR using Volumetric efficiency = 80%
(iv) Heat rejected in the condenser per TR
(v) Ideal COP **12**

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b) Explain Sensible Heating, Sensible Cooling, Humidification and Dehumidification.

c) Classify Cooling Towers & explain its application. Define Range & Approach.

Q.4 a) The specific humidity of atmospheric air at 28°C DBT and barometric pressure Hg is 0.016 Kg/Kg of dry air. Determine the following without using Psychrometric

(i) Partial pressure of water vapour.
(ii) Relative Humidity.
(iii) Dew Point Temperature.
(iv) Specific Enthalpy.

b) Derive an expression for COP of an Ideal Vapour Absorption Refrigeration System.

c) Describe various psychrometric processes in an Air washer.

Q.5 a) The following data is given for Summer air conditioning of a building.
Outside design conditions = 43°C DBT, 27°C WBT
Inside design conditions = 25°C DBT, 50%RH
Room Sensible Heat Gain = 84,000 kJ/hr
Room Latent Heat Gain = 21,000 kJ/hr
By-Pass Factor of cooling coil = 0.2
The return air from the room is mixed with the outside air before entering the cooling coil in the ratio of 4:1 by mass. Determine:

(i) Apparatus Dew Point of the cooling coil.
(ii) Inlet & Outlet conditions of air for cooling coil.
(iii) Fresh air mass flow rate.
(iv) Refrigeration load on the cooling coil in TR.

b) Classify Refrigerants with example of each type. Which refrigerants are considered friendly? Explain.

Q.6) Write short note on any **Four** of the following:

a) BEE Star Rating System.
b) Types of Compressors & Expansion Devices.
c) Thermoelectric Refrigeration.
d) Green Buildings.
e) Vortex Tube Refrigeration.
f) Deep Sea Water Air Conditioning.

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3/6/2019

426 - T.E (Machanical Engineering) (SEM-VI)(Choice Base) / 89024 - Refrigeration and Air
tioning
ode: 69127
e read Instruction Students are required to attach the respective Chart.

N 404
O. 405

28/5/2019

28.5.19

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

) 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)**
) 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%

) Describe various methods of computing average rainfall over a basin . **(10)**
) 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)**

ours	0	3	6	9	12	15	18	21	24	27	30	33	36
inates unit ograph necs)	0	90	200	350	450	350	260	190	130	80	45	20	0

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

3

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CIVIL / VI / CBC 3/6/2019

Paper / Subject Code: 88885 / Water Resource Engineering - I

(Time: 3 hours) Total marks: 80

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.

1:- 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.

2:-

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)

3:-

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%

4:-

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 ydrograph (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

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Q5:-

a) i) Derive an expression for discharge from a well fully penetrating a confined aquifer.

ii)Define aquifer , aquiclude, specific yield, specific retention and perched aquifer.

b) A 30 cm diameter well penetrates 25 m below the static water table . after 24 h of Pumping at the rate of 5400 liters/minutes , the water level in a test well at is lowered by 0.53 m , and in a well 30 m away the drawdown is 1.11 m .

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.

ii) Discuss various zones of storages with neat sketch.

b) Fix the control levels of a medium size reservoir from the following data.

i) Effective storage required for crops = 32 Mm^3

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^3)	3.3	4.1	5.25	-	42.65	47.3	55.1

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CIVIL (VI) CBC

10/6/2019

Subject Code: 36706 / THEORY OF REINFORCED AND PRESTRESSED CONCRETE

Q. P. Code : 21358

(3 Hours)

(Total Marks : 80)

1. Question No.1 is compulsory
2. Answer any three questions out of remaining
3. Assume any data, if required and state them clearly.
4. Attempt sub questions in order.
5. Illustrate answer with neat sketches wherever required.
6. Figure to the right indicates full marks.

ttempt Any Four.

- Explain the provisions of torsional reinforcing bars in restrained type of two way slabs. 05
- Write down the steps for solving the design type of problems of singly and doubly reinforced rectangular beams. 05
- Explain the behaviour of slender columns under axial load and uniaxial bending, bent in single curvature. 05
- Explain the one-way and two-way shears of foundation slabs. 05
- Establish the equations for determining the depth of neutral axis, moment of resistance and area of tension steel of an under-reinforced rectangular beam. 05

esign a doubly reinforced beam to carry a superimposed load of 60kN-m run. The overall depth and idth of the beam are restricted to 840mm and 300mm respectively. The beam has a clear span of 5m nd a bearing of 50cm on each end. Use M20 and Fe415. 10

esign a R.C.C. slab for a room 8m X 6m measuring form inside. The slab is simply supported on a 00mm thick wall. The superimposed load acting on slab is 4kN/m^2 and floor finish is 1kN/m^2 tick. ll corners are free to lift. Use M20 concrete and Fe415 steel. 10

	1	1.1	1.2	1.3	1.4	1.5	1.75	2	2.5	3
α_x	0.062	0.074	0.084	0.093	0.099	0.104	0.113	0.118	0.122	0.124
α_y	0.062	0.061	0.059	0.055	0.051	0.046	0.037	0.029	0.020	0.014

Design a cycle stand shade consists of a R.C. slab which cantilevers 3.5m on each side of central R.C. beam and is monolithic with it. The R.C. beam is simply supported on columns 375mm wide, at the ends, over a clear span of 7m. Design the shade for superimposed load of 3000N/m^2. Use M20 concrete and Fe415 steel. 10

A square column 400mm side carries an axial load of 1050kN. Design the column and a square footing of the column. The safe bearing capacity of the soil at the site is 200kN/m^2. Use M20 concrete and Fe 415 steel. 10

A prestressed beam of section 130mm wide by 400mm deep is used over an effective span of 8m to support a uniformly distributed load of 3.5kN/m, which includes the self weight of the beam. The beam is prestressed by a straight cable carrying a force of 180kN and located at an eccentricity of 50mm. Determine the location of the thrust line in the beam and plot its position at quarter and central span sections. 10

Design a T-beam to the following data : clear span=9.50m, bearing at each support =400mm, live load on beam =4kN/m^2, spacing of beams=3m c/c; thickness of slab =150mm ; M20 concrete and Fe415 steel. 10

TURN OVER

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5.

a. The initial prestressing force transmitted by a cable to a prestressed concrete beam is 390kN. Th sectional area of the prestressing wires is 325mm^2. Find the percentage loss of stress in the wir due to shrinkage of concrete only. 10

i. If the beam is post tensioned 06

ii. If the beam is pre tensioned 04

b. Explain in detail various systems of prestressing. 10

c. Write a short note on load balancing method. 05

6.

a. Design a circular column to carry an axial load of 5kN. The diameter of column is limited 600mm. Use spiral reinforcement. Use M20 concrete and Fe415 steel. 10

b. Explain the advantages of prestressing over reinforced concrete. 05

c. Write a detailed note on "losses in prestressing" 05

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C WIL / 21 / CBC 10/6/2019

Paper / Subject Code: 88886 / Elective - II Advanced Construction Equipments

(3 hours) **Marks: 80**

estion **No 1 is compulsory**

tempt any three questions from the remaining **five** questions

gures to the **right** indicate **full** marks

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

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

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

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

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

Write short notes on (**any four**).
a. Mivan technique of formwork 05
b. Power showel 05
c. GPR system 05
d. Tower Crane 05
e. Types of pile driving equipments 05
f. Hoisting Equipments 05

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