BharatiyaVidyaBhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058

December 2019 Examinations

Program: Civil Engineering — Duration: 3hr
Course Code: BTC326/PCBTC601 — Maximum Points: 100
Course Name: Geotechnical Engineering II — Semester: VI

Instructions:

1. Attempt any 5 questions.
2. Neat diagrams must be drawn wherever necessary.
3. Assume Suitable data if necessary and state it clearly

Q. No.		Questions	Points	CO	BL	PI
1	a	Compute the ultimate bearing capacity of a circular footing of 1 m diameter resting on the surface of a saturated clay of unconfined compressive strength of 100 kN/m^2. Calculate safe value if FOS is 3.	8	CO2	BL4	2.1.3.
	b	Discuss geotextiles. How are they different from geosynthetics?	7	CO1	BL2	1.2.1
	c	Discuss the classification of pile foundations.	5	CO1	BL2	1.3.1
2	a	Brief about applications of retaining wall. Differentiate between active, pressure and at rest earth pressures.	10	CO2	BL1	1.3.1
	b	Discuss the Feld's rule for determination of pile group efficiency.	6	CO1	BL1	1.2.1
	c	Discuss negative skin friction in case of pile foundation.	4	CO2	BL2	1.2.1
3	a	Explain the pile load test as per IS 2911-Part IV with a neat sketch.	10	CO1	BL3	1.3.1
	b	Draw pressure distribution diagram for cantilever sheet pile in granular soil.	6	CO1	BL2	1.2.1
	c	A 6m high retaining wall retains soil having c= 16kN/m^2, ϕ=20° and γ= 16.2 KN/m^3. Determine the earth pressure at rest. If the water table rises to the top of wall, determine the increase in the thrust on the wall. Assume submerged unit weight of sand as 10 KN/m^3.	8	CO2	BL4	1.3.1
4	a	Explain the procedure for estimating active earth pressure by Culmann's graphical method.	8	CO1	BL3	1.2.1
	b	Discuss I S code method of computation of bearing capacity of a soil.	8	CO1	BL2	1.4.1
	c	A timber pile is driven by a drop hammer weighing 30kN with a free fall of 1.2m. the	4	CO1	BL4	1.4.1

		average penetration of the last few blows was 5mm. What is the capacity of the pile according to Engineering News formula?				
5	a	Explain in detail modes of failure of bearing capacity	8	CO1	BL3	1.3.1
	b	Discuss the classification of underground conduit.	8	CO2	BL5	1.3.1
	c	Discuss the purpose of plate load test.	4	CO1	BL2	1.3.1
6	a	Compute safe bearing capacity of a square footing 1.8m x 1.8m. is placed over loose sand of density 16.0 KN/m^3. And at a depth of 0.8m	8	CO2	BL3	1.4.1
		ϕ= 30°,N_q=18.4 and N_γ=15.1, N_c=30.14 Factor of safety=3.0. Determine the total load that can be carried by the footing.				
	b	Discuss dynamic formulae along with limitations.	8	CO2	BL2	1.3.1
	c	Discuss applications of reinforced earth, retaining walls and open cuts in civil Engineering.	6	CO1	BL2	1.3.1
7	a	Determine whether failure is by group or individual action using following data:	8	CO2	BL4	4.1.1
		No. of piles in group=16, diameter of pile=50cm, spacing both ways=1.0m c/c, Cohesion=30kN/m^2, Length of pile=10m. Adhesion factor is 0.6 Determine the ultimate load capacity of the pile group.				
	b	Discuss the applications of reinforced earth in civil engineering.	6	CO1	BL2	1.2.1
	c	Discuss the settlement of Friction and end bearing piles in uniform soil.	6	CO4	BL2	1.2.1

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Examinations December 2019

Max. Marks: **100** Duration: **03 Hours**
Class: **T.Y. B.Tech. Semester: VI** Program: UG **Civil Engineering**
Name of the Course: ***Hydraulic Engineering-II*** Course Code : **BTC328**

Instructions:

1. Attempt ***Any Five*** questions
2. All questions carry equal marks
3. Answer to each question to be started on the fresh page
4. Assume suitable data if necessary and mention it clearly.
5. Draw neat diagrams.

Q. No.	Questions	Points	CO	BL	PI
1	(a) Explain with neat sketch; Hydro-dynamically smooth and rough boundaries.	10	1	2	1.2.1
	(b) A rough pipe of 30 cm diameter and 1.50 km. long carries water at the rate of 0.85 cum/sec. The wall roughness is 0.012 mm. Determine: (i) Coefficient of friction; (ii) Wall shear stress; and (iii) Centre line velocity.	10	1	4	1.3.1
2	(a)Explain: Growth of boundary layer over a curved plate, velocity distributions, pressure variation and point of separation.	10	1	4	1.3.1
	(b) For a velocity distribution $(u/U) = 2.(Y/\delta) - (Y/\delta)^2$ Determine boundary shear stress, drag force and coefficient of drag.	10	1	4	1.3.1
3	(a)What do you mean by terminal velocity of a body? What is relation between the weight of body, drag force on the body and buoyant force when the body has acquired terminal velocity?	10	4	2	1.2.1
	(b) Experiments were conducted in a wind tunnel with a wind speed of 60Km/hr. on a flat plate of size 2m and 1.5 m wide. Take density of air as 1.25 Kg/m^3. The plate is kept at an angle and the coefficients of lift and drag are 0.72 and 0.14 respectively. Determine (i) Lift force (ii) Drag force (iii) Resultant force (iv) Power expended in Overcoming resistance of the plate.	10	4	4	1.3.1
4	(a)Derive expression for most economic triangular channel section.	10	2	2	1.2.1

	(b) A rectangular channel of 3m wide has depth of water 1.8m. The slope of channel Bed is 1 in 1200 and Chezy's constant C=58. (i) Find discharge through the channel (ii) If the discharge is to be increased to a maximum by changing dimensions of the section for constant area of cross section, slope of the bed and roughness of the channel. Find the new dimensions of the channel and increase in discharge.	10	2	5	1.3.1
5	(a)Explain specific energy curve and specific force curve. (b) Determine length of back water curve by an afflux of 3.0 m in rectangular channel of width 50 m and depth 3.5 m. The slope bed is 1 in 10000. Take Manning's constant N =0.022.	10 10	3 3	2 4	1.2.1 1.3.1
6	(a)Derive differential equation for gradually varied flow. State assumptions clearly. (b) Find the normal depth of flow for a flow of 330 lps through a triangular channel section. Assume, Apex angle as 90^0, longitudinal slope 1 in 1500, Manning's n = 0.015.	10 10	3 3	4 4	4.3 4.3.4
7	(a) State Buckingham's-π theorem. The 'η' of a fan depends on density 'ρ' and viscosity of fluid 'μ', angular velocity 'ω', diameter 'D' and discharge 'Q'. Obtain a functional relationship for 'η' in terms of dimensionless parameters. (b) Estimate for a 1:25 model of spillway: (i) Discharge on prototype (Qp), if model discharge (Qm) = 0.15 m^3/sec. (ii) Velocity on model(Vm), if velocity on prototype (Vp) = 3.75 m/sec.	10 10	5 5	4 4	5.1.1 5.1.1

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

Munshi Nagar Andheri (W) Mumbai 400058

Previous Semester

December 2019

Max. Marks: 100 **Duration: 3 Hrs**

Class: T.Y. B. Tech **Semester: VI**

Name of the Course: Environmental Engineering I **Program: B. Tech Civil**

Course Code: PC-BTC605

Instructions:

- **Attempt any five questions out of seven**
- **Draw neat sketches/diagrams wherever required**
- **Assume suitable data if necessary and state it clearly at start of**
- **Figure on right indicate maximum marks, course outcomes attained bloom's level and performance indicators for the given question**
- **Please start new question on the new page and all subsections should be included together**

READ INSTRUCTIONS BEFORE ANSWERING

QN	Description	Points	CO	BL	PI
Q1	**Answer the following questions:**	(20)	1,2		
(b)	Explain ecosystem and types of ecosystem. A farmer in Chandrapur harvests wheat from 5plots of 2000 m^2 each at the end of the growing season. **Determine NPP and GPP** of a **grassland** if the dry masses for each plot: Plot 1 = 9000 kg, Plot 2 =12000 kg, Plot 3 = 10200 kg, Plot 4 = 12000 kg and Plot 5 = 9000kg. A growing season was **only 6 months out of one year**.	(05)		3,4	3.1.3 3.2.2
(c)	Describe **any one** of the following with respect to Kolhapur (i) Carbon Cycle (ii) Transfer of energy in ecosystem	(05)		2	2.1.1
Q2	**Answer of following questions:**	(20)	1,4		
(a)	Describe in brief mitigation measures or solution to the problem of air pollution as an environmental engineer.	(10)		4,5	4.2.2
(b)	Explain **any two** with short notes (i) Water pollution (ii) Soil Pollution (iii) Thermal pollution **OR** Evaluate L_{eq} **Lavg** and **Noise climate** for the following noise levels **observed every minute for 15 minutes. Plot graph too** Noise levels in dbA= 65; 72; 55; 63; 65; 72; 70; 72; 81; 90; 92; 50; 30; 45; 56.	(10)		1-3	3.1.2 4.1.1

Q3	**Answer the following questions:**	(20)	2,3		
(a)	Explain the need of water supply scheme with components that could be considered in the water supply scheme (**draw the figure for water supply scheme**)	(05)		3,4	3.1.2
(b)	As an environmental engineer **which parameters** should be considered for finding characteristics of river water? **List and explain** in detail parameters to be considered while deciding the quality of water at confluence.	(05)		4,5	4.3.1
(c)	Draw a flowsheet of surface **water treatment facility**. Give specific function of eact unit and reductions observed in various parameters	(10)		4,5	5.1.1
Q4	**Answer any two of the following questions:**	(20)	2-4		
(a)	**Canal** intake is to be designed for **a town** with population 2,50,000 where canal runs for 10 hrs in a day with a depth of 2m. Design a canal intake and calculate head loss in intake conduit if treatment works are 0.8 km away. Draw a neat sketch. Assume average consumption as 120 lpcd. Assume velocity through the screen and bell mouth to be less than 16cm/sec and 32cm/sec respectively ($V = 0.85\ CR^{0.63}\ S^{0.54}$ Take C= 130)	(10)		4,5, 6	5.2.1
(b)	Design **rapid mixing unit/units** for a city for the year 2030 if the earlier census record are as follows. The average water demand to be considered is **120lpcd**.	(10)		5	5.2.2
(c)	Design a paddle flocculator/flocculators for a city with population of 50000 and 120 lpcd avg demand Detention time= 15 min; Average G= $80s^{-1}$; Speed of paddles = 3 rpm K=0.25; $\mu = 1.0087X10^{-3}$ Ns/m^2; ρ=998 kg/m^3 at 20°C; Ratio of L: B= 3.	(10)		5	5.2.2
Q5	**Answer the following questions:**	(20)	1-3		
(a)	**Define:** WLR, G, Coagulation and flocculation, Short Circuiting in sedimentation tanks, MPN	(05)		2	2.1.1
(b)	**Design coagulant aided circular settling basin/basin for population of 3,00,000 with avg demand of 150 lpcd**	(05)		5	5.3.1
(c)	**Design rapid sand filtration unit with underdrainage system and wash water troughs** for population of 2,00,000 with avg demand of 200 lpcd.	(10)		5	5.3.1
Q6	**Answer the following questions:**	(20)	1-4		
(a)	Explain **requirement of disinfection**. Explain **breakpoint chlorination** and **dechlorination**. **Chlorine usage** in treatment of city daily is 130 kg/day with population of 3,00,000. The residual chlorine after **10 min contact** is 0.2 mg/L. Calculate dosage of chlorine in mg/L and chlorine demand in mg/L.	(10)		2,4	4.1.1 3.1.1
(b)	Explain process of **ion exchange**. Lime and soda were used for softening in **a city** with population of 3,00,000 and avg demand of 200 lpcd for treatment of following impurities $CaCl_2$= 100 mg/L; $MgSO_4$ = 200 mg/L; NaCl= 140 mg/L; Mg $(HCO_3)_2$= 200 mg/L. Compute the quantities of chemicals required to Irai river for Chandrapur in year 2040. Assume **soda ash and lime purity 90%.**	(10)		3,4	4.3.

Year	Population
1980	1,50,000
1990	1,80,000
2000	2,40,000
2010	3,29,000

Q7	Answer any four the following questions:	(20)	1-4	1,3	3.1.1
(a)	Ideal sedimentation tank	(05)			
(b)	Incineration	(05)			
(c)	Landfills	(05)			
(d)	Elements of solid waste management	(05)			
(e)	Coagulant and coagulant aids	(05)			

Formula sheet

$$P_n = P_o\left[1+\frac{r}{100}\right]^n$$

$$P_n = P_o + n\bar{x} + \frac{n(n+1)}{2}\bar{y}$$

$$\log_e\left[\frac{P_s - P}{P}\right] - \left[\frac{P_s - P_o}{P_o}\right] = -kP_s * t$$

$$P_n = (P_o + n\bar{x})$$

$$r = \sqrt[t]{r_1 * r_2 * r_3 * \ldots\ldots * r_n}$$

Al=27
Ca=20
C=12
O=16
S=32
Cl=35.5
H=1
Na=23
Fe= 55.5
Mg=24
Si=14

WLR=Q/B
WLR= Q/2πR
DT= V/Q
SOR= 12-20 $m^3/d/m^2$
SOR= 24-30$m^3/d/m^2$

SA=volume/SOR

G =300-700s^{-1}
0.5 min to 1 min

$P=\frac{1}{2}C_d\rho.A_p.v_r^3$
$C_d = 1.8\ for\ flat\ paddles$
$\rho = 998kg/m^3$
$v_r = (1-0.25)v_p$

Ratio of length to diameter of lateral ≤ 60
Spacing of laterals= spacing of orifices= 150 to 300 mm
Dia of perforations 5 to 12 mm (spacing 80 mm for 5 and 200 mm for 12mm)
Total area of perforations≤ 0.5
Total c/s area of laterals
Total area of perforation = 0.002 to 0.003
Entire filter area
Area of manifold= 1.5 to 2 times laterals
Rate of filtration = 300 to 500l/hr/m^2
Rate of filtration = 3000-6000l/hr/m^2
Max. demand= 1.8 Q

$$v_s = \frac{1}{18}\frac{g}{v}(S_s - 1) * d^2$$

Value of υ=1.002X10^{-6} m^2/sec

$$v_d = \sqrt{\left(\frac{8\beta}{f'}\right)(S_s - 1)dg}$$

$f' = 0.025 - 0.03$
g=9.8m/s^2

Q/A; Q/ perimeter; Q/b; V/Q
$V= D^2(0.011D+0.785H)$

$$G = \sqrt{\frac{P}{\mu * V}}$$

μ=1.0087*10^{-3}Ns/m^2

$$G * t = \frac{V}{Q} * \sqrt{\frac{P}{\mu V}} = \frac{\sqrt{PV/\mu}}{Q}$$

ALL THE BEST

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Previous Semester Examination

December 2019

(OLD and NEW Course)

Program: T.Y. B.Tech (Civil) **Duration:** 03 hours

Course Code: BTC-331 (Old)/PC-BTC 606 (New) **Maximum Points:** 100

Course Name: Theory of Reinforced and Prestressed Concrete

Semester: VI

Notes: 1) Attempt **any five** questions out of seven questions.
2) Use of **IS: 456-2000** code is permitted in exam.
3) Figures to the right indicate full marks.
4) Assume suitable data wherever required and state it clearly.

Q.No.	Questions	Points	CO	BL	PI
Q1.					
a)	Explain the difference between under-reinforced, over-reinforced and balanced sections.	05	CO1	L3, L4	1.3.1
b)	A simply supported beam 300 mm x 600 mm (effective) is reinforced with 5 bars of 25mm diameter. It carries a uniformly distributed load of 80 kN/m (including its self-weight) over an effective span of 6 m. Out of 5 main bars, two bars can be bent up safely near the supports. Design the shear reinforcement for the beam. Use M20 grade of concrete and Fe415 steel. Sketch the shear reinforcement details.	15	CO1	L1, L2, L3	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2
Q2.					
a)	Design an RCC column 4 m high and effectively held in position and restrained against rotation at both ends. It is carrying, a load of 1600 kN. Use M20 concrete and Fe415 steel. Sketch the reinforcement details.	10	CO1	L1, L2, L3	1.3.1, 2.1.2, 2.1.3, 2.2.2
b)	An isolated simply supported T-beam has an available flange width of 1800 mm. The thickness of the flange is 100 mm and the beam is 500 mm deep (effective). It is reinforced with 4-25 mm diameter bars. Determine the moment of resistance of the section and the safe load which the beam can carry over a span of 5 m. The web width is 250 mm. Use M20 concrete and Fe415 steel.	10	CO1	L1, L2, L3	1.3.1, 2.1.2, 2.1.3 2.2.2

Previous Semester Examination

December 2019

(OLD and NEW Course)

Q3.					
a)	A prestressed concrete beam of I-section has top flange of 1400 mm x 250 mm, bottom flange 700 mm x 180 mm, web is 150 mm wide, overall depth is 2400 mm. Determine the efficiency of the section.	05	CO2	L1, L2, L3	1.3.1, 2.1.1, 2.1.2, 2.2.2
b)	A simply supported slab of a corridor of a hospital building has a clear span of 2.5 m and is supported on beams of 230 mm width. Design the slab, if the beam is carrying a live load of 5 kN/m^2. Use M20 concrete and Fe415 steel.	15	CO1	L1, L2, L3	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2
Q4.					
a)	What is a doubly reinforced beam? State the conditions under which construction of such beams is adopted.	05	CO1	L3, L4	1.3.1
b)	A beam of symmetrical I-section spanning 8 m has a flange width of 200 mm and a flange thickness of 60 mm respectively. The overall depth of the beam is 400 mm. Thickness of the web is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm at the centre and zero at the supports with an effective prestressing force of 100 kN. The live load on the beam is 2000 N/m. Draw the stress distribution diagram at the midspan section for the following conditions: i) Prestress and self-weight ii) Prestress and self-weight and live load.	15	CO2	L1, L2, L3	1.3.1, 2.1.2, 2.1.3 2.2.2
Q5.					
a)	Design an RCC slab of size 6 m x 7 m (clear span dimensions), simply supported on 230 mm thick walls on all four edges with corners held down. The slab is carrying a total load of 4.5 kN/m^2 which includes live load and floor finishing load and excludes the self-weight of the slab. Use M20 concrete and Fe 415 steel. Sketch the plan of bottom reinforcement.	20	CO1	L1, L2, L3	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2
Q6.					
a)	Explain the pretension and post-tension method of prestressing.	05	CO2	L3, L4	1.3.1
b)	A doubly reinforced beam 300 mm x 680 mm effective is reinforced on tension and compression side with 4-25 mm diameter bars. Compression steel is placed 40 mm from top of	15	CO1 & CO2	L1, L2, L3,	1.3.1, 2.1.1, 2.1.2,

Previous Semester Examination

December 2019

(OLD and NEW Course)

	the beam. If the beam carries a bending moment of 215 x 106 N-mm, find the stresses induced in steel and concrete. Take m = 13.33.				2.1.3, 2.2.2
c)	As per IS:456-2000, state the different provisions made for design of long columns	05	CO1	L3, L4	1.3.1, 2.1.1
Q7.					
a)	A prestressed concrete beam, 200mm wide and 300 mm deep is prestressed with wires of area = 320mm^2, located at an eccentricity of 50mm and carrying an initial stress of 1000 N/mm^2. The span of the beam is 10 m. Calculate the percentage loss of stress in wires if: i)The beam is Pre-tensioned & ii) The beam is Post-tensioned. Use the following data: E_s= 210 kN/mm^2, E_c = 35 kN/mm^2 Relaxation of steel stress = 5% of the initial stress Residual shrinkage strain = 300 x 10^{-6} (Pretensioning) = 200 x 10^{-6} (Post-tensioning) Creep coefficient = 1.6 Slip at anchorage = 1.2 mm Frictional coefficient for wave effect (k) = 0.0015 per metre	15	CO2	L1, L2	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2
b)	State the assumptions made in working stress method of design.	05	CO1	L3, L4	1.3.1

**********GOOD LUCK**********

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Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to University of Mumbai)

Munshi Nagar Andheri (W) Mumbai 400058

Previous Semester (OLD)
Dec 2019

Max. Marks: 100 **Duration: 3 Hrs**

Class: T.Y. B. Tech **Semester: VI**

Name of the Course: Environmental Engineering I **Program: B. Tech Civil**

Course Code: BTC330

Instructions:

Attempt any five questions out of seven

Draw neat sketches/diagrams wherever required

Assume suitable data if necessary and state them clearly

Figure on right indicate **maximum points** for the given question, **course outcomes attained, Bloom's Level** and **Performance Indicators**

Q1	**Answer the following Questions**	(20)	CO	BL	PI
(a)	Explain ecosystem; food cycle and food web	(05)	CO3	2	2.3.1
(b)	Explain with a sketch of (i) **carbon cycle (ii) ecological pyramids**	(10)	CO3	2	2.3.2
(c)	Explain NPP and GPP. A farmer grows potatoes in his farmland which is 300 m^2 during Rabi season and **maize** in Kharif season. **Find NPP** for a farmland the farmer harvests crop as given below for area of **50 m^2 for each plot: 300kg, 800kg, 600kg, 400kg, 500kg, 300kg, 650 kg in Kharif season**. Consider yield to be repeated for Rabi season too.	(05)	CO3	2,3	4.3.2
Q2	**Answer the following questions**	(20)			
(a)	Define air pollution and classify air pollutants. Give possible sources and effects of air pollutants in India	(10)	CO1, CO2	3,4	6.2.1
(b)	Classify water pollutants. Enumerate sources and effects of water pollutants.	(10)	CO1, CO2	3,4	7.3.1
Q3	**Answer the following questions**				
(a)	A town has a population of **80,000 in 2010**. The water supply scheme is to be developed for the area for the year **2040**. The past census records are provided in **table 1**. Calculate the population for which water supply system is to be designed using any two appropriate methods for newly developing city.	(05)	CO1, CO4	4-5	3.4.2
(b)	As a city engineer which water demands are to be considered for a growing city. Further enlist the factors affecting rate of demand.	(05)	CO1, CO2	4-5	6.3.2
(c)	A **bell mouth canal intake is to be designed for a city** considering population obtained in Q3 (a) drawing water from a canal which runs for 10 hrs a day with a depth of 2 m. Calculate head loss in intake conduit if treatment works are 0.75 km away. Draw a neat sketch. Consumption of the town is to be considered 100 lpcd. Assume velocity through screens and bell mouth to be less than 16cm/sec and 32 m/sec	(10)	CO2, CO3	3-4	4.3.1

Table 1.

Year	1970	1980	1990	2000	2010
Population	15,000	30,500	48,000	61,000	80,000

Q4	**Answer the following questions**				
(a)	**Draw** a flowsheet for the treatment of each ground water source. **Describe** the function of each unit in the flowsheet. **Comment** on the efficiency of each unit with respect to relevant characteristic.	(10)	CO1-CO4	3-5	3.2.1
(b)	Define indicator microorganisms and importance of the same. Which test ascertains them?	(5)	CO1, CO2	3-5	4.2.2
(c)	Lime and soda were used for softening for treatment of following impurities $CaCO_3$= 250 mg/L; $MgSO_4$ = 310 mg/L; NaCl= 20 mg/L; Mg Cl_2= 350 mg/L. Compute the quantities of chemicals required for Ranikhet in year 2040. Assume **soda ash and lime purity 90%. (Consider data in Q 3(a))**	(5)	CO3-CO4	3-4	3.2.2
Q5	**Answer the following questions**	(20)			
(a)	Explain the concept **Ideal Settling Tank. Design Circular tank/tanks for a city with population of 60000 and a demand of 150 lpcd.**	(10)	CO2-CO4	2-3	2.2.1
(b)	Explain flocculation. Design **a paddle flocculator** for for a city with population 60000 and water demand of 150 lpcd: **Detention time= 20 min; Average G= 70s^{-1}; Speed of paddles = 3 rpm** **K=0.25; μ =1.0087X10^{-3}; ρ=998 kg/m^3 at 20°C; Ratio of L: B= 3.**	(10)	CO2-CO4	3-4	3.2.1
Q6	**Answer any two of the following questions**				
(a)	**Explain the need of filtration and filtration mechanism. Design rapid sand filter for (size and underdrainage system)** for 200 lpcd for a population of 50,000.	(10)	CO1-CO4	3-5	4.3.2
(b)	Explain the characteristic of a good disinfectant. Explain disinfectants used in water treatment. Find chlorine consumed in kg/day and chlorine dosage in mg/L for the city with a population of 60000 and avg demand as 200 lpcd if the residual chlorine **is 0.2 mg/L** and a **chlorine demand is 0.6 mg/L and average water demand of 100 lpcd.**	(10)	CO3, CO4	2-4	3.4.1
Q7	**Answer the following questions**	(20)			
(b)	Explain landfills, types of landfills and its advantages	(05)	CO1-CO4	1-2	4.2.3
(c)	The noise levels at L_{100},L_{80},L_{60},L_{40},L_{20} and $L_5$are 40db, 60db,45db,61db,63db and 60db respectively, measured during an hour of the day. Find out Lavg.,Leq and NC at the location. What is major difference in Leq and Lavg?	(05)	CO2-CO3	2-3	2.2.3
(d)	Explain with figure **(a) Incineration (b) Composting**	(05)	CO3-CO4	1-2	2.2.

Formula Sheet

$$P_n = P_o\left[1+\frac{r}{100}\right]^n$$

$$P_n = P_o + nx + \frac{n(n+1)}{2}y$$

$$\log_e\left[\frac{P_s - P}{P}\right] - \left[\frac{P_s - P_o}{P_o}\right] = -kP_s * t$$

$$P_n = (P_o + n\bar{x})$$

Al=27
Ca=20
C=12
O=16
S=32
Cl=35.5
H=1
Na=23
Fe= 55.5
Mg=24
Si=14

WLR=Q/B
WLR= Q/2πR
DT= V/Q
SOR= 12-20 $m^3/d/m^2$

V= 0.849 C $R^{0.63}$ $S^{0.54}$
Leq = L_{50} +{ $(L_{10} - L_{90})^2$ / 60}
NC = L_{10} - L_{90}
SOR= 24-30$m^3/d/m^2$

$r = \sqrt[t]{r_1 * r_2 * r_3 * \ldots\ldots * r_n}$		
SA=volume/SOR	G =300-700s^{-1} 0.5 min to 1 min	$P = \frac{1}{2} C_d \rho . A_p . v_r^3$ $C_d = 1.8\ for\ flat\ paddles$ $\rho = 998 kg/m^3$ $v_r = (1 - 0.25) v_p$
Ratio of length to diameter of lateral ≤ 60 Spacing of laterals= spacing of orifices= 150 to 300 mm Dia of perforations 5 to 12 mm (spacing 80 mm for 5 and 200 mm for 12mm) Total area of perforations≤ 0.5 Total c/s area of laterals Total area of perforation = 0.002 to 0.003 Entire filter area Area of manifold= 1.5 to 2 times laterals Rate of filtration = 300 to 5001/hr/m^2 Rate of filtration = 3000-60001/hr/m^2 Max. demand= 1.8 Q	$v_s = \frac{1}{18} \frac{g}{v} (S_s - 1) * d^2$ Value of υ=1.002X10^{-6} m^2/sec $v_d = \sqrt{\left(\frac{8\beta}{f'}\right)(S_s - 1) dg}$ $f' = 0.025 - 0.03$ g=9.8m/s^2	Q/A; Q/ perimeter; Q/b; V/Q V= D^2 (0.011D+0.785H)
$G = \sqrt{\frac{P}{\mu * V}}$ μ=1.0087*10^{-3}Ns/m^2		$G * t = \frac{V}{Q} * \sqrt{\frac{P}{\mu V}} = \frac{\sqrt{PV/\mu}}{Q}$

ALL THE BEST

BharatiyaVidyaBhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058

December 2019 Examinations

Program: Civil Engineering — Duration: 3hr
Course Code: BTC326/PCBTC601 — Maximum Points: 100
Course Name: Geotechnical Engineering II — Semester: VI

Instructions:

1. Attempt any 5 questions.
2. Neat diagrams must be drawn wherever necessary.
3. Assume Suitable data if necessary and state it clearly

Q. No.		Questions	Points	CO	BL	PI
1	a	Compute the ultimate bearing capacity of a circular footing of 1 m diameter resting on the surface of a saturated clay of unconfined compressive strength of 100 kN/m^2. Calculate safe value if FOS is 3.	8	CO2	BL4	2.1.3.
	b	Discuss geotextiles. How are they different from geosynthetics?	7	CO1	BL2	1.2.1
	c	Discuss the classification of pile foundations.	5	CO1	BL2	1.3.1
2	a	Brief about applications of retaining wall. Differentiate between active, pressure and at rest earth pressures.	10	CO2	BL1	1.3.1
	b	Discuss the Feld's rule for determination of pile group efficiency.	6	CO1	BL1	1.2.1
	c	Discuss negative skin friction in case of pile foundation.	4	CO2	BL2	1.2.1
3	a	Explain the pile load test as per IS 2911-Part IV with a neat sketch.	10	CO1	BL3	1.3.1
	b	Draw pressure distribution diagram for cantilever sheet pile in granular soil.	6	CO1	BL2	1.2.1
	c	A 6m high retaining wall retains soil having c= 16kN/m^2, ϕ=20° and γ= 16.2 KN/m^3. Determine the earth pressure at rest. If the water table rises to the top of wall, determine the increase in the thrust on the wall. Assume submerged unit weight of sand as 10 KN/m^3.	8	CO2	BL4	1.3.1
4	a	Explain the procedure for estimating active earth pressure by Culmann's graphical method.	8	CO1	BL3	1.2.1
	b	Discuss I S code method of computation of bearing capacity of a soil.	8	CO1	BL2	1.4.1
	c	A timber pile is driven by a drop hammer weighing 30kN with a free fall of 1.2m. the	4	CO1	BL4	1.4.1

		average penetration of the last few blows was 5mm. What is the capacity of the pile according to Engineering News formula?				
5	a	Explain in detail modes of failure of bearing capacity	8	CO1	BL3	1.3.1
	b	Discuss the classification of underground conduit.	8	CO2	BL5	1.3.1
	c	Discuss the purpose of plate load test.	4	CO1	BL2	1.3.1
6	a	Compute safe bearing capacity of a square footing 1.8m x 1.8m. is placed over loose sand of density 16.0 KN/m^3. And at a depth of 0.8m	8	CO2	BL3	1.4.1
		ϕ= 30°,N_q=18.4 and N_γ=15.1, N_c=30.14 Factor of safety=3.0. Determine the total load that can be carried by the footing.				
	b	Discuss dynamic formulae along with limitations.	8	CO2	BL2	1.3.1
	c	Discuss applications of reinforced earth, retaining walls and open cuts in civil Engineering.	6	CO1	BL2	1.3.1
7	a	Determine whether failure is by group or individual action using following data:	8	CO2	BL4	4.1.1
		No. of piles in group=16, diameter of pile=50cm, spacing both ways=1.0m c/c, Cohesion=30kN/m^2, Length of pile=10m. Adhesion factor is 0.6 Determine the ultimate load capacity of the pile group.				
	b	Discuss the applications of reinforced earth in civil engineering.	6	CO1	BL2	1.2.1
	c	Discuss the settlement of Friction and end bearing piles in uniform soil.	6	CO4	BL2	1.2.1