Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2161306 **Date: 26/10/2016**

Subject Name: Design of Water Treatment Units

Time: 10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Design Bar screen for average flow of 40 MLD. Flow conditions in incoming trunk sewer is given by: **14**

i. Diameter of trunk sewer =1.53m
ii. Depth of flow at peak design flow = 1.0m
iii. Velocity at peak design flow = 0.8m/s
iv. Drop of screen chamber flow with respect to sewer invert = 0.08m
v. Peaking factor = 2

Q.2 **(a)** Design tube settler module of a square cross section for design flow of 1 MLD. Assume suitable tube cross section, length and angle of inclination .Draw its line sketch. **07**

(b) Define and explain the following terms: **07**

i.SOR ii.WOR iii.Scour Velocity
iv.Velocity Gradient v.Tip Velocity vi.Relative velocity
vii.Settling velocity

OR

(b) Enlist the factors affecting for selection of treatment processes for water treatment & explain any two. **07**

Q.3 **(a)** For surface water sources prepare a flow diagram & explain the treatment scheme for following **14**

i. Conventional water treatment plant.
ii. Surface water with algae.

OR

Q.3 **(a)** For ground water sources prepare a flow scheme & explain water treatment units for following **14**

i. Iron & Manganese removal
ii. Water treatment with chemical softening

Q.4 **(a)** Design Clariflocculator for the design flow of 15 MLD. Assume suitable data for design & draw a line sketch for it. **14**

OR

Q.4 **(a)** Design a circular radial flow sedimentation tank for a city with estimated population of 50,000. Assume average flow is 360L/capita/day. Design for 2hrs detention time at 120% of average flow. Determine tank depth and diameter to produce an overflow rate of $35m^3/m^2day$. Check design for WOR, horizontal velocity & draw line sketch of sedimentation tank. **14**

Q.5 **(a)** Design filter bed,gravel bed and underdrainage system for Rapid Sand filter for **14**

design flow of 2.5 X 10^4 m^3/day

OR

Q.5 (a) Make a bar diagram in terms of $CaCO_3$ for a water with following composition and soften the water by a suitable method and calculate the dosage of relevant chemicals. **14**

Ca^{+2} =149.2	Mg^{+2} =65.8	Na^{+} = 17.4
SO_4^{-2} =29.9	Cl^{-} =17.8	HCO_3^{-} =185
CO_2 =29.3		

****