

Total No. of Questions :8]

SEAT No. :

**P4052**

[Total No. of Pages :3

**[5255] - 550**

**M.E. (Water Resources and Environmental Engineering)**  
**ENVIRONMENTAL HYDRAULICS AND ENVIRONMENTAL**  
**STRUCTURES**

**(2013 Pattern) (Semester - II) [501086]**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

**Q1)** Write a short note on (Any Five)

**[10]**

- a) Pipe and connections.
- b) Various types of valves.
- c) LVDT.
- d) Clavarino's Equation.
- e) Birnie's Equation.
- f) Diffusion.

**Q2)** a) Explain working of internal gear pump with figure.

**[5]**

- b) Determine the power of pump and optimum head if efficiency of pump is 85%. The pump is running at 800 rpm giving the following relationship. **[5]**

$Q$ (Discharge) in $\text{m}^3/\text{min}$	Head in meter
0	24
4.6	21.2
6.2	20
14	18.1
18.2	14.2
23	0

The head of system is  $H_m = 16 + 9.98 \times 10^{-3} Q^2$  in meter.

**P.T.O.**

**Q3) a)** The impeller of a centrifugal pump has 1.3m outside diameter. It is used to lift 1900 liters of water per second against a head of 12m. Its vanes make an angle of  $45^\circ$  with the direction of motion at outlet and runs at 430 rpm. If the radial velocity of flow at outlet is 04 m/s. Find the monometric efficiency. Also find the power required if the overall efficiency is 85%.**[5]**

b) Explain working of screw pump with figure. **[5]**

**Q4)** An air receiver consist of a cylindrical portion 3.5 meter length and 1.5 meter diameter. It is closed by hemispherical ends. The pressure is not exceed 3.5 Mpa. If the material is steel having yield point 300 Mpa and if factor of safety is 2.5 is used, calculate the required wall thickness of cylinder and thickness of hemispherical end. Assume joint efficiency as 0.92 for the shell and 0.8 for the end. Also determine storage capacity of the vessel. **[10]**

**Q5) a)** A three story RC frame building with each story having height of 4 meter. Total load on each Floor are 4100 kN on first floor, 3100 kN on second floor, 2600 kN on third floor and roof load is 2050 kN resp. The soil below foundation is assumed to hard rock. Find out the total base shear force as per Is code - 1983 - (Part - I) - 2002. **[6]**

b) A beam having cross section are of 110 millimeter square, length of 1.5 meter is attached by two spring at end one at top and other is at bottom find natural frequency of vibration of system. Take  $E = 200 \times 10^3$  Mpa.**[4]**

**Q6)** A closed vessel is to be design to with stand internal pressure of 110 Mpa having inside diameter of 610 mm following properties assumed. Estimate thickness on basic of

a) Maximum principle stress theory.

b) Maximum shear stress theory.

Yield strength = 400 Mpa, Ultimate tensile strength = 500 Mpa, Poisson ratio 0.5 **[10]**

**Q7)** A pressure vessel consist of cylinder shell of inside diameter of 2.5 meter which is closed by torispherical head with a crown radius of 1150 mm. The operating pressure inside the cylinder is 2 Mpa. The yield strength is 400 Mpa. The corrosion allowance 3mm and weld efficiency 94%. Determine thickness of cylindrical shell and torispherical head. **[10]**

**Q8) a)** Determine depth of foundation required for square column carrying load of 600 kN vertical. The SBC of soil is 200 kN/m<sup>2</sup>. Density of soil 30 kN/m<sup>3</sup>, angle of repose is 20°. **[5]**

**b)** Determine thickness of wall for water tank by working stress method having capacity of 2000 cum. meter, if height of tank is 4.5 meter. Use M30 concrete and Fe 250 steel. **[5]**

