

M.E. (Civil / WREE)

**ENVIRONMENTAL HYDRAULICS & ENVIRONMENTAL
STRUCTURES****(2013 Pattern) (Semester - II) (501086)***Time :3 Hours]**[Max. Marks :50**Instructions to the candidates:*

- 1) *Attempt any 5 questions.*
- 2) *Assume suitable data wherever necessary.*
- 3) *Use of non - programable calculator is allowed.*

- Q1)** a) Explain the working of internal gear pump with figure. **[5]**
- b) Determine the power of pump & optimum head if efficiency of pump is 80%. The pump is running at 800 rpm giving the following relationship.

Q(Discharge) in m ³ /min	Head in meter
0	23.5
4.5	20.1
8	19.0
13	17
18	14
22.8	0

The head of system is $H_m = 16 + 9.98 \times 10^{-3} Q^2$ in meter. **[5]**

- Q2)** a) A centrifugal compressor having inside diameter of 40mm & outside diameter of 80 mm & width of blade is 30 mm. Temperature of air at inlet is 30°C, inlet and outlet angle of blade are 8° and 20°. Temperature in the pipe is 40°C and pressure ratio is 2. Determine power required to drive compressor. **[5]**
- b) Draw hydraulic circuit which contains 2 part actuator, 4/2 valve, PRN, pressure gauge, pump, motor, tank, for oil. **[5]**

- Q3)** a) Explain working of strain guage with figure. **[5]**
- b) What are different type of liquid level measurement technique use. **[5]**

- Q4)** a) Explain working of distillation column with figure. [5]
 b) Explain working of RID with figure and applications. [5]
- Q5)** a) A four story RC frame building with each story having height of 3.0 meter. Total load on each floor are 3000 kN on first floor, 3000kN on second floor, 2500 kN on third floor and roof load is 20,000 kN respectively. 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) Four spring are connected in parallel position and series position having stiffness as 2 N/M if weight of 1kg is attached in both position find natural frequency of system. [4]
- Q6)** a) An air receiver consist of a cylindrical portion of 4 meter length and 1.2 meter diameter. It is closed by hemispherical ends. The pressure is not exceed 3 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 0.9 for the shell and 0.8 for the end. Also determine storage capacity of the vessel. [8]
 b) Write formula for thickness of vessel on basis of maximum principle stress theory. [2]
- Q7)** A closed vessel is to be design to with stand an internal pressure of 50MPa having inside diameter of 500mm. Following properties may be assumed. Yield strength =300 MPa, ultimate tensile strength = 700 MPa, Position ratio = 0.5, FOS is 2. Estimate wall thickness on the basis of: [10]
 i) Maximum principal stress theory.
 ii) Maximum shear stress theory.
 iii) Maximum principal strain theory
 iv) Distortion energy theory.
- Q8)** Determine the thickness of well and steel required for water tank by working stress method having capacity of 1000 cum. meter, if height of tank is 4 meter. Use M30 concrete and Fe 250 steel. [10]

