Total No. of Questions : 8] SEAT No. :

P4526 [Total No. of Pages : 3

[4760] - 1050

M. E. (Civil) (Water Resources and Environmental Engineering)
ENVIRONMENTAL HYDRAULICS AND ENVIRONMENTAL STRUCTURES
(2012 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Use data sheet.***
7) ***Use of IS code 46 and IS code-1983 (Part - I) - 2002.***

Q1) a) Find minimum span length for support and thickness of pipe required for the following data Diameter of pipe = 120mm, weight of pipe 14 Kg/meter, Weight of water 10 Kg/meter, Stress of material 900 kg/cm^2, pressure of liquid in pipe is 20 kg/cm^2. Take E = 2 × 106 Kg/cm^2. **[5]**

b) A single acting reciprocating pump running at a speed of 50 rpm delivering water 0.005 cum meter/sec. The diameter of piston is 190 mm and its stroke length 300mm suction and delivery head are 4 meter and 11 meter. Determine theoretical discharge, coefficient of discharge, % of slip, Power required and efficiency of pump. **[5]**

Q2) a) Design hydraulic circuit for the following data. **[5]**

Load during forward stroke = 10 KN, In return stroke 8 KN, Forward and backward speed is 4 m/min and 6 m/min. Total length of stroke is 300mm. Make a provision to hold the cylinder anywhere in between two positions. Select different components as per suitability and also specify rating of pump.

b) Explain any two types of pressure control valve. **[5]**

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Q3) a) Explain working of LVDT **[5]**

b) What are different types of level measurement used and explain any two in detailed. **[5]**

Q4) a) The vapor pressure of n-heptane and n-octane are given the following table at 101.1 KPa. Assure that the Raoult's and Dalton's Law apply. Plot the graph of x-y and Temp -x, Temp-y **[5]**

Temp. in °C	98	105	110	116	120	125
p°A KPa	101.1	125.23	139.98	159.89	179.98	205.1
p°B KPa	44.4	55.5	64.5	74.7	86.6	101.32

Boiling point of n-heptane and n-octane is 98°C and 120°C.

b) Determine EBCT, Mass of GAC, Volume of water to treated for the following data. **[5]**

Volume of GAC used = 16 cum. Meter, Volumetric flow rate = 1500 lit/min, Initial and final concentration of pollutant is 6mg/lit and 0.05 mg/lit.

Freundlich Capacity Factor = 25 (mg/gm) (Lit/mg)1/n, and intensity parameter n = 0.8

Q5) a) A vibration system define by the parameter m = 100 kg. **[5]**

K = 150 N/m, C = 4 N s/m

Determine Damping factor, natural frequency, logarithmic discernment.

b) A four storey Steel Frame structure is use for carrying pipe line in plant situated in zone IV. The height of each floor is 4 meter and total height of RCC structure is 16 meter. The dead load and live load on each floor are as follows. **[5]**

On First Floor = 4000 KN, On Second Floor = 5000KN, On Third Floor = 6000KN, On Fourth Floor = 2400KN respectively. The soil below foundation is assumed to be hard rock. Find out total base shear as per IS Code – 1893 – (Part – I) - 2002.

Q6) a) An air receiver of a cylindrical portion of 8 meter length and 1.0 meter in diameter. It is closed by hemispherical ends. The pressure is not exceeding 9 N/mm^2. If the material is stress having yield point 250 N/mm^2 and if factor of safety is 3 used. Find the required thickness of the cylinder and thickness of hemispherical shape cylinder assumes joint efficiency for both cylinders is 0.8. **[5]**

b) A closed vessel is to be design to withstand internal pressure of 200 MPa having inside diameter of 400mm Following properties may be assumed Yield Strength = 400 MPa, Ultimate Tensile strength = 600 MPa, Poission ratio = 0.4, Estimate wall thickness on the basis of **[5]**

i) Maximum Principle Stress Theory.

ii) Maximum Shear Stress Theory.

Q7) a) A pressure vessel consist of a cylindrical shell of inside diameter 2000mm. which is closed by cylindrical head with a crown radius of 1400 mm. The operating pressure inside the cylinder is 4.5 MPa. The yield strength of the material is 500 MPa. The corrosion allowance is 2mm and weld efficiency is 80%. Determine the thickness of cylindrical shell and the cylindrical head. **[5]**

b) What are different types of head used in pressure vessel. **[5]**

Q8) a) Determine area and depth of foundation of square column carrying load of 1000 KN vertical. The SBC of soil is 100 KN/M^2, density of soil is 20 KN/m^3, angle of repose = 30°. **[5]**

b) A beam of section 25 cm × 40 cm if, shearforce of 18 KN and torsion moment is 2 KNM at factorized load. Assume M15 mix concrete and 0.22% torsion steel at a given section. State weather torsion reinforcement is required or not. **[5]**