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II SEMESTER M.TECH. (STRUCTURAL ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE/JULY 2017

SUBJECT: OFFSHORE STRUCTURAL ENGINEERING [CIE 5259]

REVISED CREDIT SYSTEM

(/ /2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data may be suitable assumed.

1A.	Explain briefly the advantages and disadvantages of jacket type and gravity type offshore structure.	**06**
1B.	Determine the wave length by Airy wave theory for a wave of period 10 sec in 55 m depth of water. Also, determine the maximum horizontal water velocity and wave speed assuming a wave height of 8.0m.	**04**
2.	Determine the maximum wave force and moment at the base exerted by sea waves on the horizontal member of the structure as shown in Fig. Q.2. All piles are 1.0 m meter diameter. Adopt C_D=0.8 and C_I=1.5. The depth of water is 40 m. wave length 125 m and 12 sec wave period.	**10**
3.	An offshore gravity structure consists of four concrete columns supporting a deck and equipment weighing 50,000kN. The inside and outside diameter of the each column is 4m and 5m respectively. Assuming the columns unflooded; determine the dynamic amplification factor for waves of 9 sec period. Calculations show that a total force of 1000kN acting at the deck level on the entire three-dimensional structure will cause a deck deflection of 10mm. Take ξ = 0.05, S.W.L = 60m and deck level = 70m from the foundation level. Assume the deck acts as rigid diaphragm. Also discuss the static method of analysis on dynamic effects of wave forces.	**10**
4.	For a typical pile of an offshore structure having a diameter of 1.2m and wall thickness of 15 mm is driven to a depth of 90m. Cyclic wave forces on the overhead structure induce estimated lateral cyclic load at ground-line of 1500kN towards right and estimated cyclic moment of 2500kN-m clockwise. The soil consists of sand having angle of internal friction =30^o, submerged density of the soil =6.75kN/m^3 , N=1.9 and k=8.5MPa. Determine the deflection and rotation of the pile at the ground-line.	**10**
5A.	Determine the pressure induced stresses existing in a member at water depth of 55 m from still water level of an offshore structure. The member has an outside diameter of 1.0 m and a wall thickness of 20mm. Assume the ends of the member are fixed	**05**

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	against displacement and rotation. Consider Poisson's ratio =0.25	
5B.	(b)What are the differences in behavior between free cylinders and restrained cylinders when subjected to pressure induced loading?	**05**

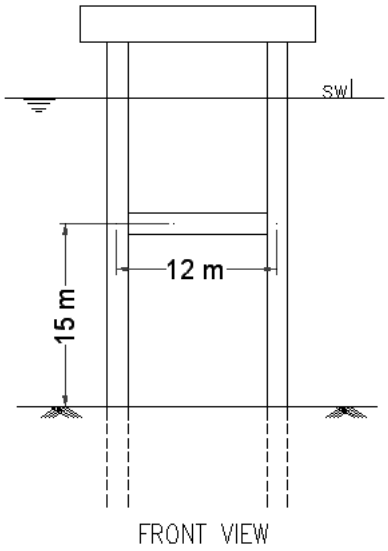

Fig. Q.2