Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (STRUCTURAL ENGINEERING)

END SEMESTER EXAMINATION May/June 2023

SUBJECT: OFFSHORE STRUCTURAL ENGINEERING [CIE-5020]

REVISED CREDIT SYSTEM

Time:9.30 AM TO 12.30 PM Date: 31/05/2023 MAX. MARKS: 50

Instructions to Candidates:

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

Q.no		Marks	CO'S	BTL
1A	Illustrate with neat sketch of a typical Gravity platform	02	CO1	4
1B	For water depth of 60m, wave of height 5.0m, and wavelength 100m, evaluate the distribution of maximum horizontal and vertical velocity along the depth of water. Adopt Airy wave theory.	05	CO2	5
1C	Illustrate with neat a sketch mud loading on a offshore structures.	03	CO2	5
2A	A soft clay deposit 5 m slides against six embedded pile 1.2 m outside diameter. Assume shear strength of 1.5 MPa, Asses the total force exerted on piles, Adopt N=9.0	03	CO2	5
2B	Evaluate the maximum horizontal and vertical wave force on a member of length 15 m shown in Fig.Q2B by sea waves of height 5.0 m. The member has an external diameter of 0.7 m and wall thickness of 15mm. The wave length is 120 m and assume C_I=2 and C_d=1.	07	CO2	5
3	Asses the depth of penetration of pile 1.2 m diameter and 20mm thick to resist a maximum compression load of 9000 kN and maximum tensile load of 7500 kN. The soil is clay soil having shear strength negligible at mud level and increases linearly 1.5 kN/m^2/m Consider N_c=9. The specific weight of submerged soil is 6.5 kN/m^3.	10	CO3	5
4A	Evaluate the axial deformation of a pile of length 25m in a clay soil having elastic modulus of 8000 kN/m^3. The pile diameter is 1.0 m and wall thickness of 15mm. The axial load on the pile is 7000 kN.	05	CO3	5
4B	Evaluate the maximum force and moment at the base exerted by sea waves and wind on vertical member 50m length measured from sea bed having external diameter of 1.2m in a depth 30 m of water. Adopt C_D=1.0, C_I=2.0 and C=0.7. The wave height is 5m and wave length is 120 m at the site. The wind velocity is 200kmph at site and may be assumed act uniformly along the exposed length of vertical member. Adopt shape factor of 0.7.	05	CO2	5
5	An offshore gravity structure consists of four concrete columns supporting a deck and equipment weighing 100,000kN. The inside and outside diameter of the each column is 6m and 7.2m, respectively. Evaluate the dynamic amplification factor for waves of 5-sec wave period. Take damping value as 5%, S.W.L = 90m and deck level = 110m from the foundation level. Assume the deck acts as rigid diaphragm. Comment on the results.	10	CO5	5

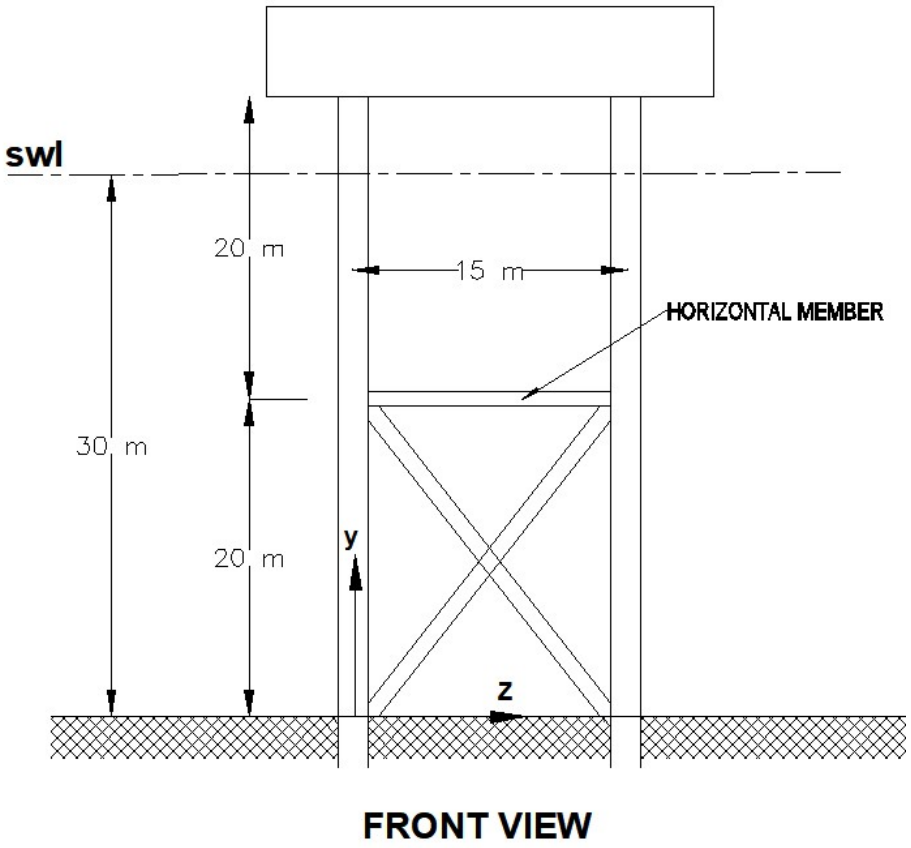

Fig.Q2B