Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (STRUCTURAL ENGINEERING)
END SEMESTER EXAMINATION

SUBJECT: **OFFSHORE STRUCTURAL ENGG. [CIE 5425]**

REVISED CREDIT SYSTEM

Time: 3 HRS. MAX. MARKS: 50

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.

Q. No		MARKS	CO
1A	Illustrate any one complaint offshore structure with a neat sketch.	02	01
1B	Illustrate with a neat sketch the current loading and ice loading are considered on an offshore structure. Evaluate the load on an offshore structure having outside diameter of 5m for an ice sheet 1.1 m thick and 10m width. The crushing strength of ice may be assumed as 2MPa and force coefficient as 0.7.	08	02
2	Evaluate the maximum horizontal wave force on member 1-2 indicated in Fig. Q2. The wave height is 6m and wavelength of 150 m. The member has outer diameter of 0.75m. Adopt C_D=1.0 and C_I=2.0. Consider uniform water motion along submerged length of the member.	10	02
3	Evaluate the Max. deferential settlement of a square footing having as size of 15mx15m. The soil supporting the footing is over consolidated clay having compression properties Cc=0.2 and Cr=0.02. Consider the 6 layers of soil each of 6m. The submerged specific weight of soil may be assumed as 7 kN/m^3. The maximum stress of 100kN/m^2 experienced earlier by soil may be considered as constant throughout the depth. The axial load on the footing is 5000kN. Comment on the results.	10	03
4A	Evaluate the axial deformation of a pile of length 40m in a clay soil having elastic modulus of 7000 kN/m^3. The pile diameter is 1.2 m and wall thickness of 20mm. The working axial load on the pile is 10000 kN.	05	03
4B	Evaluate the pressure induced stresses existing in a member at water depth of 75 m from still water level of an offshore structure. The member has an outside diameter of 1.2 m and a wall thickness of 20mm. Assume the ends of the member are fixed against displacement and rotation. Consider Poisson's ratio =0.25. Also calculate associated shear stress and plot variation of longitudinal and radial stresses across depth. Also evaluate the stress at remote end.	05	04
5	An offshore gravity structure consists of three concrete columns supporting a deck and equipment weighing 20,000kN. The inside and outside diameter of each column is 5m and 4.4m, respectively. Evaluate the dynamic amplification factor for waves of 3-sec wave period. Take damping value as 5%, S.W.L = 80m and deck level = 100m from the foundation level. The analytical results indicate that the top displacement is 100mm when a lateral concentrated load of 10000kN is applied at the deck level. Assume the deck acts as rigid diaphragm. Comment on the results.	10	05

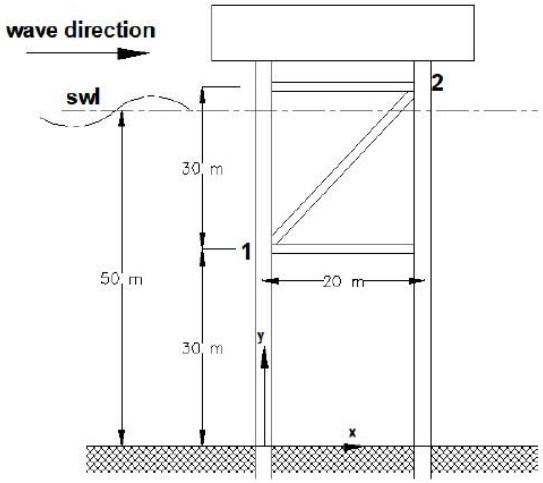
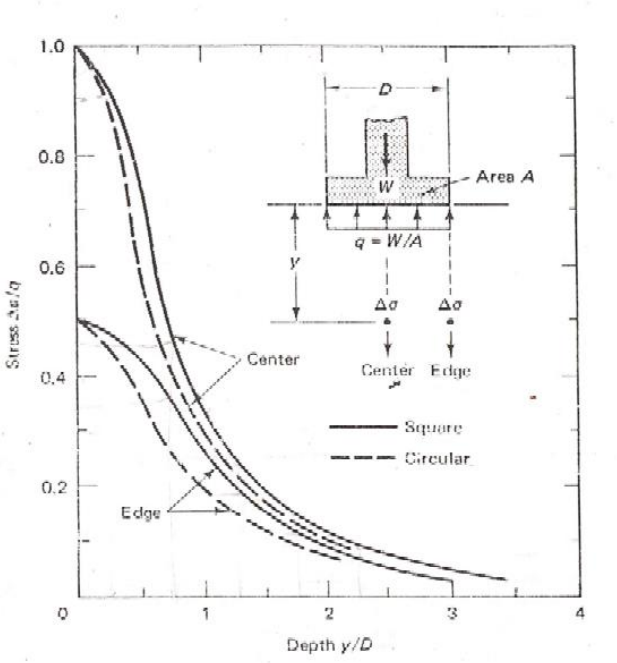

wave direction
swl
30 m
1
2
50 m
20 m
30 m
y
x

Fig. Q2


D
W
Area A
q = W/A
y
Δσ
Δσ
Center
Edge
Center
Edge
Square
Circular
Stress Δσ/q
Depth y/D
1.0
0.8
0.6
0.4
0.2
0
1
2
3
4