UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Offshore operations (PEAU 7003)　　　　　　　　　　Semester: I
Programme: M.Tech - Petroleum Engineering
Time: 03 hrs.　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100
Instructions: Open book exam, hand written notes is allowed, photocopies of hand written notes are not allowed, and wave tables are allowed.

SECTION A (4x5= 20 Marks)

S. No.	Questions	Marks	CO
Q 1	A wave of 8 seconds enters from deep water to a water depth of 100 m. Find its wave length, celerity in deep water and at 100 m water depth.	5	CO1
Q 2	A solitary wave has wave height of 12 m, find its energy at 200 m water depth.	5	CO2
Q 3	What are different types of risers or pipeline installation methods?	5	CO3
Q 4	Write short note about towed sledges and ROVs	5	CO4

SECTION B (4x10= 40 Marks)

Q 6	For a wave of height 1.5 m and period 6.5 s, plot the variation of orbital velocity and acceleration in the vertical and horizontal directions of a particle at a position 2.8 m below SWL and 12 m above the sea bed. Estimate the maximum velocities at this position, at SWL and at the sea bed	5+5	CO1
Q 7	What is neutral, positive and negative stability of offshore floating structures- explain with diagrams. Explain about stability of Semi-submersible, TLP and SPAR.	5+5	CO2
Q 8	Water piping from a storage tank is connected to a primary shut-off valve, which is hydraulically actuated with an electrical remote control. The water pressure rate is Q=10m³/h. the working pressure is 6 bar. The pipe details are: Material is medium grade steel, Nominal size: 100mm, Inner diameter=105mm, wall thickness: 4.5mm, pipeline length=500m, operating temperature is 40ºC, Modulus of elasticity= 200 GPa, water density= 1000 kg/m³, bulk density of water K=2.05GPa Find velocity of pressure wave, velocity of fluid before change, maximum pressure and maximum total pressure due to water hammer	5+5	CO3
Q 9	What is an ROV and AUV, write the differences between ROV and AUVs and their uses in all kinds of offshore exploration.	5+5	CO4
	OR		
	Explain about the challenges faced during the oil and gas exploration in arctic and how the ROVs helped in solving the problems related to the oil and gas exploration in arctic.		

SECTION-C (20 x 2= 40 Marks)			
Q 10	Check for pipeline in place condition as per DNV rules 1981 for the pipeline data Diameter of pipeline (D)=800mm, wall thickness (t_s)= 13mm, concrete coating thickness (tc)=50mm, steel density (ρ_s)=7850 kg/m^3, concrete coating density (ρ_c)=3040kg/m^3, sea water density (ρ_w)=1025 kg/m^3, density of fluid inside pipe (ρ_f)=900 kg/m^3, internal pressure (p_i)=200 kPa, water depth at installation (d)=60m, unsupported span of pipeline (L_s)=20m, yield strength of material (F_y)=358 MPa, Young Modulus of Material (E) = 200 GPa, Applied axial thrust tension (T_a)=1100 kN, Combined wave and current velocity = 3m/s, Acceleration = 1m/s^2, Hydrodynamic coefficients C_D=0.6, C_M=2.0, C_L=0.9.	20	CO3
	OR		
	Check pipeline for Vortex induced vibration in water for the data given data Diameter of pipeline (D) = 350mm, wall thickness (t_s)= 13mm, steel density (ρ_s)=7850 kg/m3, sea water density (ρ_w)=1025 kg/m^3, unsupported span of pipeline (L_s)=30m, yield strength of material (F_y)=358 MPa, Young Modulus of Material (E) = 200 GPa, flow velocity=0.6 m/s, Strouhal number S_N=0.2.		
Q 11	Explain about floater drilling operations, subsea well heads and casings, riser considerations and vessel to sea floor guidance system.	20	CO4