Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Course: Offshore drilling and production (PTEG411) Semester: VII

Programme: B.Tech: APE UP

Time: 03 hrs. Max. Marks: 100

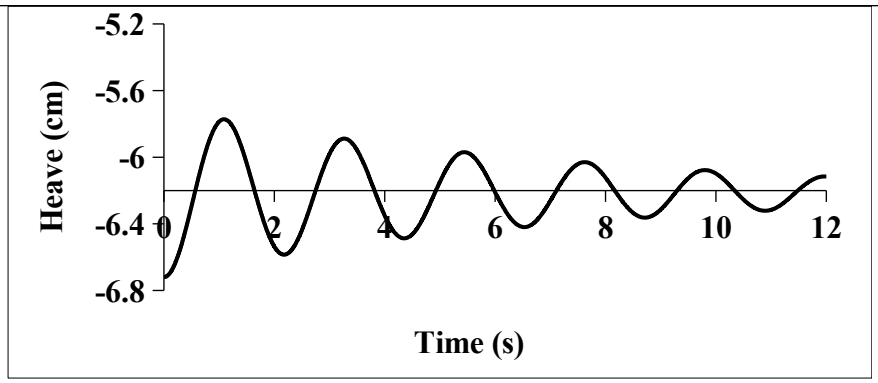
Instructions: Open book exam, printed ppts are allowed, hand written notes is allowed, photocopies of hand written notes are not allowed, everyone should bring calculators, calculators should not be borrowed, everyone should bring wave tables.

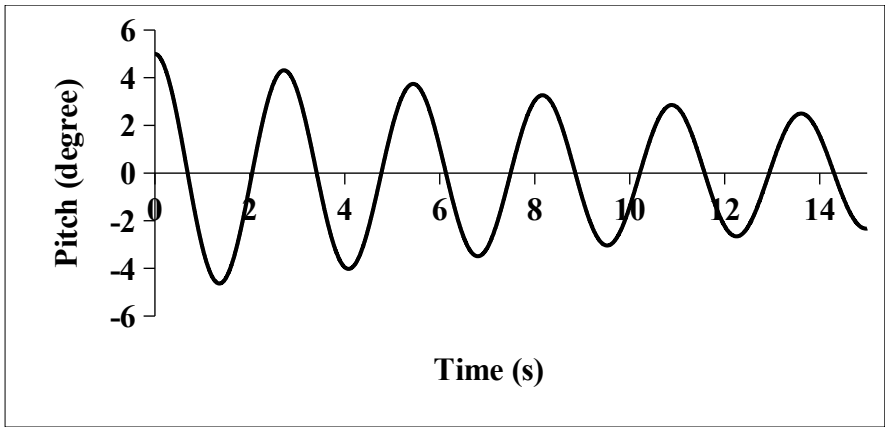
SECTION A

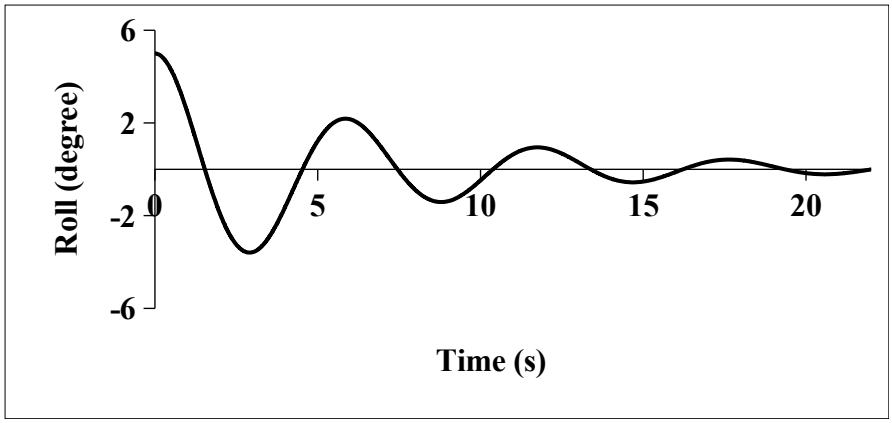
S. No.		Marks	CO
Q 1	A wave of 8.8 seconds enters from deep water to a water depth of 50 m. Find its wavelength and celerity in deep water and at 50 m water depth.	4	CO1
Q 2	A solitary wave has wave height of 10 m, find its energy and wave celerity at 200 m water depth	4	CO2
Q 3	Define what are shallow water flows and where do they occur?	4	CO4
Q 4	A spiral stranded steel wire has diameter 12 cm, calculate its breaking strength, submerged weight and stiffness	4	CO3
Q 5	When is riser disconnected during offshore drilling and production operations?	4	CO3 and CO4

SECTION B

Q 6	A wave has a height of 2 m and period of 7 secs, plot the variation of orbital velocity and acceleration in the vertical and horizontal directions of a particle at a position 5 m below SWL and 20 m above the seabed.	10	CO1
Q 7	A drilling riser of diameter 1.2 m is installed at water depth of 100 m is subjected to regular wave of amplitude 1.0 m with wave period of 12 sec. The drag and inertia coefficients are 0.6 and 2.0 respectively. The wind driven current at surface is 2.5 m/ s. Calculate the horizontal wave force at 30 m from sea water level at x = 0 and t = 2.5 sec.	10	CO2
Q 8	The experimental tests conducted on model semi-submersible platform in wave basin. The logarithmic decay curves for heave, pitch and roll are given below. The weight of the model is 25 kg. Calculate its damping and natural time period in heave pitch and roll degrees of freedom for the following graphs.	10	CO3







Q 9	Why tensioning system is necessary in offshore drilling and production operations? Explain about different tensioning systems using suitable diagrams.	5+5	CO4
	OR		
	What is a bumper sub, where it is installed and explain about their functioning during the drilling operations? Explain how the heave compensation achieved during the drilling operations from an offshore rig with sketches.		
	SECTION-C		

Q 10	A drilling riser is installed in water depth of 2000m, its base is located 5 m above the seabed and its hanged at the platform deck which is above 10 m from water level. The weight plus added mass/length of the riser is 800kg/m, the riser is tensioned at the top with 160000 kg. Find its first natural frequency, the bandwidth of reduced velocities where it under goes vibration, mass ratio, reduced damping at damping ratio 0.05 and find the velocity at which it under goes resonance.	20	CO3
	OR		
	A model of drilling riser is installed in a current flume of water depth 1 m, its mass plus added mass with out considering inner fluid is 0.354 kg/m. The riser filled with bentonite drilling fluid of specific gravity 1.35. The riser outer diameter is 1.4 cm and inside diameter is 1 cm, the length of the riser is 1.2 m and riser is tensioned with 5 kg mass. Find its first natural frequency, the bandwidth of reduced velocities where it under goes vibration, mass ratio, reduced damping at damping ratio 0.05 and find the velocity at which it under goes resonance.		
Q 11	What are shallow water flows? How the drilling is executed if we encounter SWF- explain all the solutions with sketches.	20	CO4

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SECTION A

S. No.		Marks	CO
Q 1	A wave of 11 seconds enters from deep water to a water depth of 100 m, find its wave length and celerity in deep water and at 100 m water depth.	4	CO1
Q 2	A solitary wave has wave height of 12 m, find its energy and wave celerity at 100 m water depth	4	CO2
Q 3	What are the components of the mooring system?, Calculate breaking strength and submerged weight of a six strand steel wire whose diameter is 7 cm.	2+2	CO3
Q 4	What are guidelines and where they are used? What is the maximum tension required for them?	2+2	CO4
Q 5	Explain about kick detection in offshore operations.	4	CO4
	SECTION B		
Q 6	A wave has a height of 1.5 m and period of 9 secs, plot the variation of orbital velocity and acceleration in the vertical and horizontal directions of a particle at a position 6 m below SWL and 18 m above the seabed.	10	CO1
Q 7	A drilling riser of diameter 1.0 m is installed at water depth of 200 m is subjected to regular wave of amplitude 1.2 m with wave period of 10 sec. The marine growth around the riser is 100 mm. The drag and inertia coefficients are 0.7 and 1.9 respectively. The wind driven current at surface is 2.0 m/s. Calculate the horizontal wave force at 20 m from sea water level at x = 0 and t = 2.0 sec.	10	CO2
Q 8	After a detailed analysis, a combination of spiral stranded steel wire of diameter 10 cm and ORQ grade chains of 10 cm are used for mooring a semi-submersible by the contractor. The water depth is 1000 m. The combination of wire and chain is in such a way that top 20 % and bottom 30 % of the mooring line is made up of chain. Design the mooring system for the above combination by performing calculations for all the parameters. Give a reason, which one is better whether studded or studless link with spiral stranded steel wire. Use a suitable diagram for explaining the design.	10	CO3

Q 9	Write about the marine riser classification for drilling and production operations with suitable diagrams and riser design considerations for Deepwater applications.	10	CO4
	OR		
	What is a TTR and explain about the different types of components used on TTRs and their design considerations.		
	SECTION-C		
Q 10	A drilling riser is installed in water depth of 2500m, its base is located 10 m above the seabed and its hanged at the platform deck which is above 15 m from water level. The weight plus added mass/length of the riser is 900 kg/m, the riser is tensioned at the top with 150000 kg. Find its first natural frequency, the bandwidth of reduced velocities where it under goes vibration, mass ratio, reduced damping at damping ratio 0.06. Find the velocity at which it under goes resonance.	20	CO3
	OR		
	A model of drilling riser is installed in a current flume of water depth 1 m, it mass plus added mass without considering inner fluid is 0.354 kg/m. The riser outer diameter is 1.4 cm and inside diameter is 1 cm, the length of the riser is 1.2 m and riser is tensioned with 5 kg mass. Find its first natural frequency, the bandwidth of reduced velocities where it under goes vibration, mass ratio, reduced damping at damping ratio 0.05 and find the velocity at which it under goes resonance.		
Q 11	What are shallow fracture gradients in offshore operations? Discuss about shallow gas kicks and their prevention.	10+10	CO4