



# PRESIDENCY UNIVERSITY

BENGALURU

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## Mid - Term Examinations - MARCH 2026

Date: 10 - 03- 2026

Time: 02:00pm - 03:30pm

<b>School:</b> SOE	<b>Program:</b> B.Tech.-PET		
<b>Course Code:</b> PET3003	<b>Course Name:</b> Offshore Drilling and Petroleum Production Practices		
<b>Semester:</b> VI	<b>Max Marks:</b> 50	<b>Weightage:</b> 25%	

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	2	28	20	-	-

### Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

## Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x 2M=10M

1	Define buoyant force and state Archimedes' principle.	2 Marks	L1	CO1	
2	Recognize the purpose of station keeping in offshore drilling vessels.	2 Marks	L1	CO2	
3	State the key differences between neutrally buoyant, negatively buoyant and positively buoyant floating units with examples.	2 Marks	L1	CO2	
4	Match Column A with Column B:	2 Marks	L1	CO2	
	Column A				Column B
	(a) Positive metacentric height ( $GM > 0$ )				(1) Neutral stability
	(b) Zero metacentric height ( $GM = 0$ )				(2) Vessel is unstable
(c) Negative metacentric height ( $GM < 0$ )	(3) Vessel is stable				
5	State the basic criteria for the construction of offshore structures.	2 Marks	L1	CO2	

## Part B

### Answer the Questions.

**Total Marks 40M**

<b>6.</b>	<b>a.</b>	<p>(i) Illustrate how the relative positions of CG and center of buoyancy affect stability.</p> <p>(ii) A metal pontoon of dimensions 4 m × 2 m × 1.5 m floats horizontally in water.</p> <p>The unit weight of the pontoon material is 7.5 kN/m<sup>3</sup>.</p> <p>Determine:</p> <p style="margin-left: 20px;">(a) Weight of the pontoon</p> <p style="margin-left: 20px;">(b) Volume of water displaced</p> <p style="margin-left: 20px;">(c) Depth of immersion</p> <p><i>(Unit weight of water = 9.81 kN/m<sup>3</sup>)</i></p>	<b>10 Marks</b>	<b>L3</b>	<b>C02</b>
	<b>b.</b>	Classify the six degrees of freedom of a ship into translational and rotational motions, and illustrate each motion with suitable sketches.	<b>10 Marks</b>	<b>L3</b>	<b>C02</b>
<b>Or</b>					
<b>7.</b>	<b>a.</b>	<p>A semi-submersible drilling vessel is exposed to a steady wind. Apply the ABS wind force equation to determine the wind force acting on the vessel under the following conditions:</p> <ul style="list-style-type: none"> <li>• Wind velocity, <math>V_A = 45</math> knots</li> <li>• Shape coefficient, <math>C_s = 1.0</math> (deck house)</li> <li>• Height coefficient, <math>C_h = 1.20</math></li> <li>• Projected area, <math>A = 12,500</math> ft<sup>2</sup>.</li> </ul>	<b>10 Marks</b>	<b>L3</b>	<b>C02</b>
	<b>b.</b>	<p>Apply the current force equation to determine the current drag force acting on a semi-submersible offshore drilling vessel subjected to a uniform ocean current. Given:</p> <ul style="list-style-type: none"> <li>• Current velocity, <math>V_c = 3.5</math> ft/s</li> <li>• Shape (drag) coefficient, <math>C_s = 1.0</math> (hull surface type)</li> <li>• Projected area normal to current, <math>A = 9,000</math> ft<sup>2</sup></li> <li>• Conversion factor, <math>g_c = 1.0</math></li> </ul> <p>Determine the magnitude of the current drag force acting on the vessel</p>	<b>10 Marks</b>	<b>L3</b>	<b>C02</b>
<b>8.</b>	<b>a.</b>	Demonstrate the working principle of a jack-up rigs and classify the types of jack-up rigs based on their bottom support system.	<b>10 Marks</b>	<b>L3</b>	<b>C03</b>

	<b>b.</b>	(i) Illustrate the complete hierarchy of offshore rigs and platforms with the help of a neat flow chart. (ii) Differentiate between offshore rigs and onshore rigs.	<b>10 Marks</b>	<b>L3</b>	<b>C03</b>
<b>Or</b>					
<b>9.</b>	<b>a.</b>	Illustrate the marine drilling riser system with a neat sketch and discuss its components and response to platform motions and environmental loads.	<b>10 Marks</b>	<b>L3</b>	<b>C03</b>
	<b>b.</b>	(i) Classify the different types of jacketed offshore platforms.  (ii) Examine how jacketed platforms differ from jack-up rigs, and interpret their respective applications in offshore oil and gas operations.	<b>10 Marks</b>	<b>L3</b>	<b>C03</b>