# UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

**End Semester Examination, December 2017**

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|---|---|
| **Program: M.Tech  Petroleum Engineering** | **Semester –    I** |
| **Subject (Course): Offshore Operations** | **Max. Marks   : 100** |
| **Course Code   : PEAU7003** | **Duration       : 3 Hrs** |
| **No. of page/s: 4** | |

**Instructions:** Use of books, handouts, calculators is allowed but Cellphone, Internet, is NOT ALLOWED.

## Section-A

**Answer all questions**  (Select the correct answer(s) or write short answers)          **[10X2=20]**

1. Most of the Production from offshore KG Basin is
   a. Crude Oil and Condensate (light oil)
   b. Crude Oil only
   c. Catagenic Gas (Wet Gas)

   d. Metagenic Gas (Dry Gas)

2. If for an offshore installation the Wind Force at 10m height is 100 KIPs, what would be the Wind force for an installation with same shape and area but with 20m height?

3. Between Ocean Bottom Note (OBN) and Ocean Bottom Cable (OBC), which system would you choose if the water depth is 750m and WHY?

4. The Primary purpose of using a Magnetometer Survey (offshore Site survey of Seabed condition) is _____

5. The difference between Acoustic Sub-Bottom-Profilers and Side-Scan-Sonar or Multibeam-Echo-Sounders is _____

6. Shallow Water Flows are generally  _____ ( under / normal / over ) pressure zones found below Mud Line caused by rapid sedimentation followed by seal

7. In an offshore well producing Dry Gas the obvious choice of Subsea X-Tree would be
   a. Partial Drilling Horizontal Tree
   b. Eccentric Dual bore Vertical Tree
   c. Full Drilling Horizontal Tree
   d. Concentric Monobore Vertical Tree

8. Out of the various operational issues faced offshore which ones affect Gas Production most
   a. Corrosion
   b. Hydrates
   c. Wax
   d. Asphaltenes
   e. Scale
   f. Sand erosion

9. Why is it extremely important NOT to have large volumes of Free Gas in Riser?

10. What are the differences between Cementing Operation Onshore versus Offshore?
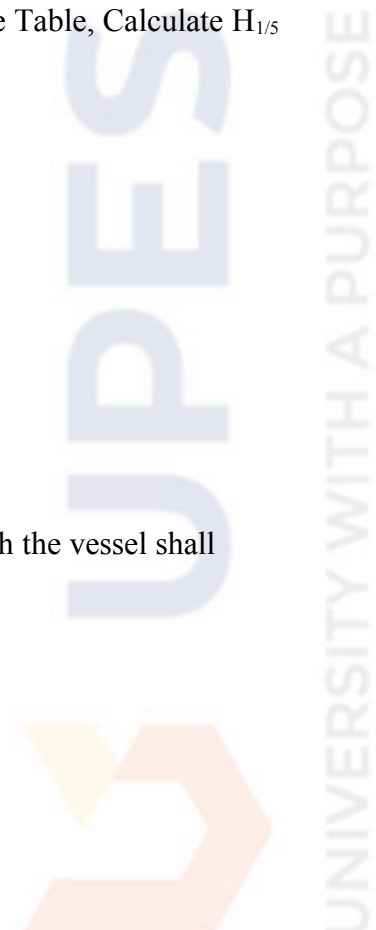

## Section – B

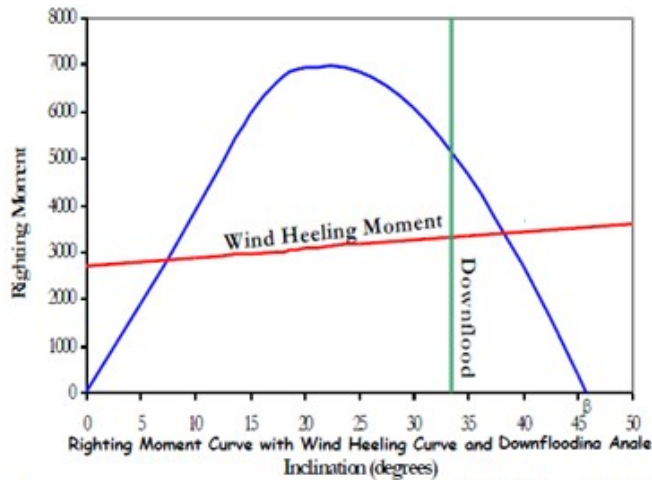**Answer all questions**                                                                 **[5X8=40]**

11. From a Wave Height Statistics point of view, for the data given in the Table, Calculate $H_{1/5}$

| wave height intervals (m) | wave height average (m) | number of waves $n$ | frequency quotient $f(x)$ | cumulative frequency quotient $F(x)$ |
|---|---|---|---|---|
| 0.25-0.75 | 0.5 | 15 | 0.100 | 0.100 |
| 0.75-1.25 | 1.0 | 30 | 0.200 | 0.300 |
| 1.25-1.75 | 1.5 | 55 | 0.367 | 0.667 |
| 1.75-2.25 | 2.0 | 21 | 0.140 | 0.807 |
| 2.25-2.75 | 2.5 | 14 | 0.093 | 0.900 |
| 2.75-3.25 | 3.0 | 9 | 0.060 | 0.960 |
| 3.25-3.75 | 3.5 | 5 | 0.033 | 0.993 |
| 3.75-4.25 | 4.0 | 1 | 0.007 | 1.000 |
| total | | 150 | 1.000 | |

12. From the Diagram given below , find the angle of Inclination at which the vessel shall stabilize (under Wind Heeling Moment )

8000
7000
6000
5000
4000
3000
2000
1000
0

Righting Moment

Wind Heeling Moment

Downflood

0    5    10    15    20    25    30    35    40    45    50
Righting Moment Curve with Wind Heeling Curve and Downflooding Angle
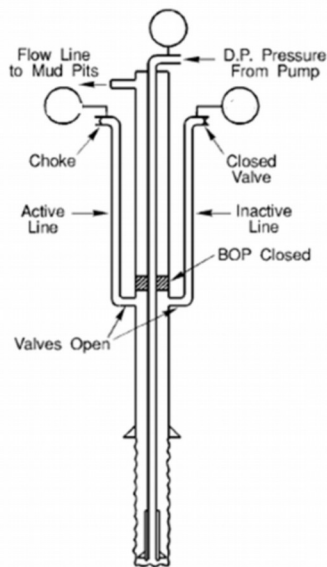Inclination (degrees)

13. Write the Advantages and Disadvantages of various types of Drill String Motion Compensators in a tabular form   and explain with Diagram, how Active Drill String Motion Compensation is done on an offshore Floater Rig

| Drill String Motion Compensator | Advantages | Disadvantages |
|---|---|---|
| Passive | | |
| Active | | |

14. During a well control operation, CLFP data obtained prior to Kick using OMW of 10 ppg is as per below table.

| Pump Rate | Circulating thru Riser | Circulating thru Choke |
|---|---|---|
| 1 bpm | 105 psi | 225 psi |
| 2 bpm | 115 psi | 245 psi |
| 3 bpm | 125 psi | 265 psi |

Flow Line to Mud Pits

D.P. Pressure From Pump

Choke

Closed Valve

Active Line

Inactive Line

BOP Closed

Valves Open

The influx has been removed, the OMW has been replaced by Balance Mud weight of 11 ppg

The final Drill Pipe Circulating pressure is 400 psi for 11 ppg mud @ 2 bpm.

If the inactive line Pressure is showing 350 psi then what is the pressure on the active line?

Show all calculations

15. In a Dual gradient Drilling method, using Seabed Pumping (as in Chevron Maxlift system)
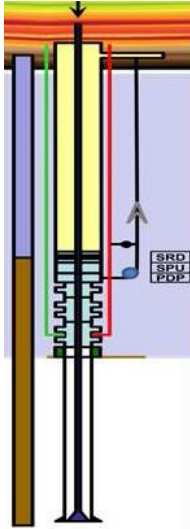


> Total Depth of a vertical offshore well to TD is 5000 ft measured from mean sea level. Water Depth is 3000 ft.
>
> The BOP Stack, LMRP are connected to the Well Head, and the Mud Lift Pump (PDP), Solids processing Unit (SPU) and Subsea Rotating Device (SRD) are connected above the LMRP.
>
> The total height from the wellhead to top of SRD is 135 ft.
>
> Mud weight is 15 ppg, Seawater is 8.5 ppg
>
> What is the Bottom Hole Pressure? Show all calculations

## Section – C

**Answer all questions** [2X20=40]

16. You are required to choose between a Drill-Ship and Semi-Submersible for an upcoming Deep-water project in offshore India KG basin. In KG, the weather conditions are moderate for most of the time of year but cyclones happen at least twice a year but with sufficient notice. There is 1 confirmed well and 3 conditional wells to be drilled. All wells are about 20 Kms of each other. Water depth is around 2000m and TD is around 3000m for all wells. The project is expected to last less than 1 year. Both the Drillship and the Semi-submersible being considered are currently working in North Sea area. Evaluate each of the selection criteria and come up with your recommendations giving sufficient explanation

17. While running Casing in an offshore well being drilled with a Drillship, the Casing is stuck two Casing joints above the intended landing depth near T.D. Explain with diagram of each step, the sequence of operations that are involved in bringing the situation under control. Label all the equipment

_____ X _____