

Name:

Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, July 2020**

**Course: PEAU 3004 Production Engineering II**  
**Program: APE VI(Upstream)**  
**Time: 03 hrs.**

**Semester: VI**

**Max. Marks: 100**

**Instructions:**

This question paper has two sections, Section A and Section B.

There are total of three questions in this question paper. One in Section A and two in Section B.

Section A consist of multiple choice based questions and has the total weightage of 60%.

Section B consist of long answer based questions and has the total weightage of 40%.

The maximum time allocated to Section A is two Hrs.

Section B to be submitted within 24 hrs from the scheduled time

The section B should be attempted in blank white sheets (hand written) with all the details like programme, semester, course name, course code, name of the student, SAP-id at the top and signature at the bottom (right hand side bottom corner)

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**Read questions carefully and give precise answers.**

**All questions are compulsory**

**1 mark for each question**

**SECTION A**

1. MC API range of crude oil ranges from 10 to 50 Correct 5 to 10  
Incorrect 100 to140 Incorrect 70 to 90 Incorrect
2. MC Which internal component of an oil and gas separator achieves maximum oil  
and gas separation Inlet nozzle Incorrect oil outlet Incorrect  
Diverter Ccorrect Level controller Incorrect
3. MC What is sloshing takes place in Fixed platforms Incorrect FPSO  
Correct Onshore area Incorrect Both onshore and offshore  
Incorrect

4. MC Oil and gas separators are designed as per API--- 650 Incorrect 12 J  
Correct 112 Incorrect 670 Incorrect
5. MC  $V_t$  is terminal velocity. It is represented as  $V_t$ . It is Inversely proportional to viscosity Correct Directly proportional to drop size Correct  
Directly proportional to difference in specific gravity Correct All of them Correct
6. MC Drag coefficient for turbulent in an oil and gas separator is a function of Reynolds number. For laminar flow it is  $24/Re$  Correct  $42/Re$  Incorrect  
 $78/Re$  Incorrect  $15/Re$  Incorrect
7. MC Erosional velocity of mixture is given by  $V_e = C \sqrt{M}$ . What is range of value of C  
275 to 300 Incorrect 100-150 Correct 300-325 In correct  
425-450 Incorrect
8. MC Slenderness ratio in a horizontal separator is given by  $L/d$  Incorrect  
 $12L/d$  Correct  $21L/d$  Incorrect  $10L/d$  Incorrect
9. MC In a vertical separator seam to seam length is given by  $h+76/12$   
Correct  $h+67/12$  Incorrect  $h+76/21$  Incorrect  $h+6/12$  Incorrect
10. MC "In Souders Brown equation, range of K factor for a spherical separator is "  
0.2-0.35 Correct 0.25-0.30 Incorrect 0.20-0.30  
Incorrect 0.5-1.0 Incorrect
11. MC Re-entrainment velocity in a separator operating at 1500 psi is 3 ft/sec  
Incorrect 2 ft/min% Incorrect 2ft/sec Correct 3 ft/min  
Incorrect
12. MC Equipment used for demulsification are Heater Treater Correct  
Pre heaters Incorrect Static mixers Incorrect Injection systems  
Incorrect
13. MC Heat input for an insulated vessel (heat loss is assumed to be 10% of heat input) is approximated  $Q = 16T(0.5q_o + q_w)$  Correct  $Q = 16T(q_o + q_w)$   
Incorrect  $Q = 16T(0.5q_o + q_w)$  Incorrect  $Q = 16T(0.5q_o)$  Incorrect
14. MC What should be water content of emulsion when it enters electrostatic chamber of heater treater? Between 3-5% Correct Upto 10% Incorrect  
Upto 8% Incorrect No water should be allowed Incorrect
15. MC "In demulsification, bottle test is conducted for" Screening demulsifiers  
Correct To find suitable bottle for storage Incorrect For buying suitable bottle  
Incorrect All of them Incorrect
16. MC Critical voltage in electrostatic separation of water the Minimum voltage required  
Incorrect Maximum voltage required Correct There is no such critical voltage  
Incorrect None of these Incorrect

17. MC A combination grid in electrostatic separation uses Both AC and DC voltage Correct Grid is made of composit material Incorrect Independent of voltage Incorrect Major component is AC voltage Incorrect
18. MC General range of settling time for heavier oils in emulsion treaters? 3 to 5 minutes Incorrect 10 minutes Incorrect Less than 2 minutes Incorrect More than 15 minutes Correct
19. MC "A meter has a capacity to measure minimum oil flow rate of 100 bbls/hr and a maximum flow of 1,600 bbls/hr. What is turn down? " 16 Correct 1.6 Incorrect 160 Incorrect 100 Incorrect
20. MC Resolution in a meter is Maximum flow rate it can measure Incorrect Minimum rlow rate it can measure Correct There is no such term Incorrect Maximum error Incorrect
21. MC Minimum fluid velocity in a multiphase pipeline sizing should be 18 to20 ft/sec Incorrect 10 to 15 ft/sec Correct 20 to 25 ft/sec Incorrect 5 ft/sec Incorrect
- 22.
23. MC Intelligent pigging of pipelines is done for To know pipeline health Correct Cleaning of pipeline Incorrect To install sensors in pipeline Incorrect Removal of water and oil from pipeline Incorrect
24. MC Pressure in centrifugal pump is expressed in terms of Atmosphers Incorrect Inches of water column Incorrect Feet Correct psi Incorrect
25. MC Head loss in suction piping of a centrifugal should be less than 1 ft per 100 ft of pipe length Correct 20 ft per 100 ft.of pipe length Incorrect 5 ft per 100 ft. of pipelength Incorrect No loss of head Incorrect
26. MC Capacity of a single acting positive displacement pump is given by  $s = (A \times L_s \times N \times m) / 31$  Incorrect  $s = (A \times L_s \times N \times m) / 231$  Incorrect  $s = (A \times L_s \times N \times m) / 23$  Incorrect  $s = (A \times L_s \times m) / 231$  Correct
27. MC Isentropic head in a compressor is given by  $H_{is} = 53.3z_{avg}(T_s / S) [ k / (k - 1) ] [ (P_d / P_s)^{(k-1)/k} - 1 ]$  Correct  $H_{is} = 53.3z_{avg}(T_s / R) [ k / (k - 1) ] [ (P_d / P_s)^{(k-1)/k} - 1 ]$  Incorrect  $H_{is} = 53.3z_{avg}(T_s / T) [ k / (k - 1) ] [ (P_d / P_s)^{(k-1)/k} - 1 ]$  Incorrect  $H_{is} = z_{avg}(T_s / S) [ k / (k - 1) ] [ (P_d / P_s)^{(k-1)/k} - 1 ]$  Incorrect
28. MC Volumetric efficiency of a positive displacement compressor is High Correct Moderate Incorrect Low Incorrect All of these Incorrect
29. MC Double-Acting Cylinder Displacementof positive displacement compressor is given by "PD =  $(2d_c^2 - d_r^2)SN / 2,000$  " Incorrect "PD =  $(2d_c^2 - d_r^2)SN / 2,20$  " Incorrect "PD =  $(2d_c^2 - d_r^2)SN / 2,200$  " Correct PD =  $(2d_c^2 - d_r^2)SN$  Incorrect

30. MC Pilling Bedworth ratio is given by  $\frac{m_d}{m_D}$  " Incorrect  $\frac{d}{nmD}$  " Incorrect  $\frac{m_d}{nm}$  " Incorrect  $\frac{m_d}{nmD}$  " Correct
31. TF Inlet diverter of an oil and gas separator achieves maximum oil and gas separation TRUE Correct LASE Incorrect
32. TF Viscosity of natural gas varies from 0.01 to 0.024 cp at standard conditions TRUE Correct FALSE Correct
33. TF "When the oil drop reaches terminal velocity, drag force and bouyancy force are equal" TRUE Correct FALSE Incorrect
34. TF Sand jets are installed in separator are installed in separator for sand blasing of separator TRUE Incorrect FALSE Correct
35. TF Vortex breaker is installed at the inlet of separator TRUE Incorrect FALSE Correct
36. TF Re-entrainment is a phenomenon caused by high gas velocity at the gas liquid interface of a separator TRUE Correct FALSE Incorrect
37. TF The interfacial tension between oil and water is high when no emulsifier is present TRUE Correct FALSE Incorrect
38. TF In oil internal emulsions water is in continous phase TRUE Correct FALSE Incorrect
39. TF Naturally-occurring surface active materials normally found in crude oil serve as demulsifiers TRUE Incorrect FALSE Correct
40. TF Demulsification does not remove salt from crude oil TRUE Incorrect FALSE Correct
41. TF Desalting is done if residual salinity is more than 10 pounds per thousand barrels TRUE Correct FALSE Incorrect
42. TF "Repeatability is meter's ability to reproduce different measurement for a set of constant conditions of flow rate, temperature, viscosity, density, pressure." TRUE Incorrect FALSE Correct
43. TF Infererance meters measures some dynamic property and that is used for calculation of flow rate TRUE Correct FALSE Incorrect
44. TF Ultrasonic meter is a bi-directional meter TRUE Correct FALSE Incorrect
45. TF Galvanic protection for corrosion control in an oil tank is not required TRUE Incorrect FALSE Correct
46. TF Spitzglass Eqn is used for highpressure Pipe lines < 12 in.in dia. TRUE Incorrect FALSE Correct
47. TF In a multiphase flowline maximum recommended velocity is 60 ft/sec for CO2 corrosion inhibition. TRUE Incorrect FALSE Correct

48. TF In offshore welded pipes are lowered from the front side of the barge TRUE  
Incorrect FALSE Correct
49. TF In offshore for shallow water pipeline laying S aly method is preferred TRUE  
Incorrect FALSE Correct
50. TF In intellegent pigging crack detection is done by magnetic flux leakge tool  
TRUE Incorrect FALSE Correct
51. TF Centrifugal pump is potential energy pump TRUE Incorrect FALSE  
Correct
52. TF Natural gas compressors are used for oil production TRUE Correct  
FALSE Incorrect
53. TF Axial compressors are low pressure high discharge TRUE Correct FALSE  
Incorrect
54. TF "Compressor capacity can be expressed in mass flow rate,rate standard  
volume flow" TRUE Correct FALSE Incorrect
55. TF "If  $\frac{M_d}{nM_D} < 1$ , volume of corrosion product is less than volume of  
metal from which product is formed." TRUE Correct FALSE Incorrect
56. TF "H2S is soluble in water and produces a weak acid and lowers the pH  
57. " TRUE Correct FALSE Incorrect
58. TF Sulfide stress cracking occurs due presense of carbon di oxide TRUE  
Incorrect FALSE Correct
59. TF Erosion corosion occures due to high velocity fluid containg some fine solids  
TRUE Correct FALSE Incorrect
60. TF Cavitation corosion occures due to high fluid velocity TRUE Correct  
FALSE Incorrect

**PART B****40 MARKS****Course Name: Production Engineering II****Programme Name: B. Tech, APE (UP)****Course Code: PEAU 3004****Instructions:****Semester: VI****Time: 24 hrs.****Max. Marks: 40**

1. Answers will be checked for Plagiarism (similarity), and maximum permissible limit is 10%, above that will be considered as Non-submission.
2. The questions should be attempted in blank white sheets (hand written) with all the details like
  - Name of the student, Sap Id
  - Programme, Semester,
  - Course name, Course code,

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**Section B**

Q1	<p>(a) Final removal of water from difficult emulsions relies on electrostatic separation of water from oil. Explain water separation. Use relevant equations.</p> <p>(b) Calculate free settling velocity of a water drop of 10 micron. Specific gravity of oil is 0.8 and that of water 1.02. Take value of viscosity of oil as 10 cp.</p>	<b>10x2</b>	<b>CO2</b>
Q 2	<p>(a) What are the important internal parts of a centrifugal compressor? Explain any two.</p> <p>(b) What is surge and stonewall condition in centrifugal compressor? Explain their effect on compressor?</p>	<b>10x2</b>	<b>CO6</b>