UNIVERSITY OF MINES AND TECHNOLOGY. TARKWA

FIRST SEMESTER EXAMINATIONS, DEC 2014

COURSE NO: **PE 271**

COURSE NAME: **DRILLING OPERATIONS AND EQUIPMENT**

CLASS: **PE II** TIME: **3 HOURS**

Name**:** _____Index Number: _____

ANSWER SECTIONS A - C ON THE QUESTION PAPER

SECTION A (0.5 Mark Each)

State whether the following statements are true or false.

1. The greater the height of a derrick, the shorter the section of pipe that can be handled and, thus, the slower a long string of pipe can be inserted in or removed from the hole.
2. Pipe rams seal on a designated range of sizes, while variable bore ram (VBR) are designed to seal on a particular size.
3. Semi-submersible rigs have more cross sectional area in the water line and make it less stable than drill ship.
4. Semi-submersibles are used to drill in deep and remote waters while drillship is used to drill in hostile environment.
5. Mud cleaner is a combination of a hydrocyclone and a desander, and is use only for moderately high density fluid.
6. A kelly saver sub is used between the swivel and the first joint of drillpipe.
7. Slips are used to grip a drillstring and the Kelly to prevent them from falling into the hole while a new joint of pipe is being added to the drillstring.
8. Some stabilizers run with the BHA can have a blade OD a little bigger than the bit diameter.
9. All loose or floppy dresses must be worn only in the offices and not on the field.
10. A marine riser compensates for the moving drilling deck of floater.

SECTION B (1 Mark Each)

11. What provides the hoisting and breaking power required to raise or lower strings of a pipe?

12. Name any drilling rig that has its BOP (blowout preventer) at the surface of the water?

13. What provides a suspension point and pressure seals for casing strings that runs from the bottom of a hole section to the surface pressure control equipment?

14. Which rig is also called self –elevating rig?

15. Most rig power is consume by what operations?

16. What are the two Mobile floating Platforms?

17. What equipment allows within the drillstring, different tools having the different diameters to be made up (or joined together)?

18. What rigs is designed to withstand the forces of moving ice?

19. What refers to the process of removing the drillstring from the hole to change a portion of the downhole assembly and then lowering the drillstring back to the hole.

20. The central slot under the drilling floor on a floating rig is called what?

21. The very first drilled in an area where no oil or gas has been produced is called what?

22. Which of the preventers is designed to close off the wellbore completely when the drillstring is out of the hole?

23. The tendency of a floating object to move from bow to stem is termed what?

24. What is used to close the BOP hydraulically?

25. Which of the preventers is designed to seal off the wellbore around *specific size(s)* of tubular?

26. What is the name of the space between the drill pipe and the wellbore is called?

27. What is the name of the modern rotary system?

28. Which of the mud tanks are good fluid sucked from for circulation?

29. Whatis the quickest indicator used to detect a kick?

30. Mud pumps are generally of the reciprocating types, which of them is generally used offshore?

SECTION C (2 Marks Each)

31. What are the two routine drilling operations performed with the hoisting system?

32. Severe wear of drilling lines occur at what points of the hoisting system?

33. List any four main principal components of a circulating system.

34. What is the difference between a primary and a secondary formation pressure control system?

35. What is a Kick?

36. Name four (4) effects of blowouts:

37. Why should one avoid the use of active pits as a hole fill up volume indicator?

38. List three (3) techniques that could be used in monitoring a well.
    a)
    b)
    c)

39. In the process of drilling, if the mud flow indicator records the following, what does it mean in terms of volume?
    i. Gain in pit volume =
    ii. Lost in pit volume =

40. Give three reasons why we drill?
    i.
    ii.
    iii.

SECTION D

Answer Questions 1-3 and any one from 4-5.

All conversion factors are provided

Note:

- **1 HP = 550 ft.lbf/s = 33000 ft-lbf/min = 746 W = 0.746 kW,**
- **1 Btu = 778 ft-lbf = 252 cal = 1055 J = 10.41 lit.atm** **P = wT** **$Q_i = W_f H$**
- $A_p = \left(\frac{d^2}{1{,}029.4}\right) bbl/\ ft$ $F_p = \frac{3\pi}{4} L_s E_v d_l^{\ 2}$ $F_p = \frac{\pi}{4}(2) L_s (2d_l^{\ 2} - d_r^{\ 2}) E_v$
- $P_i = F_f v_f$ $P_h = W v_b$ $F_f = \frac{W}{En}$ $F_d = \left(\frac{1+E+En}{En}\right) W$ $F_{de} = \left(\frac{n+4}{n}\right) W$
- **231 in.^{3} = 1 US gallon, 42 U.S. gallons = 1 U.S. barrel.**

1. The following data was obtained on a gasoline engine operating in a prony brake at the Jubilee field of Ghana.

Engine Speed(rpm)	Torque (ft-lbf)	Fuel Consumption (gal/hr)
800	1000	16.5

Fuel Type	Density (lbm/gal)	Heating Value (Btu/lbm)
Diesel	7.2	19,000
Gasoline	6.6	20,000

a) Compute the brake horsepower in horse power

b) Compute the overall engine efficiency. ***(15 Marks)***

2. A drilling rig at the Jubillee must hoist a load of 500,000 lbf. The drawworks can provide a minimum input power of 1000 hp. Eight (8) lines a strung between the crown blocks and the traveling block and the dead line is anchored to a derrick leg on one side of the v-door. Assume the efficiency of the 8 lines to be 0.841. ***(20 marks)***

   a) Calculate the static tension in the fast line when upward motion is impending.
   b) Calculate the maximum hook horsepower available.
   c) Calculate the time that would be required to pull 270 ft stand.
   d) Calculate the derrick load when upward motion is impending.
   e) Calculate the maximum equivalent derrick load.
   f) Calculate the derrick efficiency factor.

3. A drillstring is composed of 10,000 ft of 5-in OD, 4.276-in ID ., 19.5-Ibm/ftdrillpipe and 1,000 ft of 8-in. OD by 2.75-in. ID drill collars when drilling a 9.875-in. borehole. Assuming that the borehole remains in gauge, compute the number of pump cycles required to circulate mud from

   a. the surface to the bit and
   b. from the bottom of the hole to the surface if the pump factor is 0.1881 bbl/cycle.

   (15 marks)

4. Compute the pump factor in units of barrels per stroke for a duplex pump having 6.5-in. liners, 2.5-in. rods, 18-in. strokes, and a volumetric efficiency of 90%. ***(10 marks)***

5. A rig is to be chosen to drill a well at the Saltpond Basin at a water depth of about 400 feet. The weather is unfriendly. What drilling rig will be the most economically suitable rig to select? Give reasons for the selection. Where will the BOP be place? ***(10 mark)***

AMORIN