PROGRAM : NATIONAL DIPLOMA
           EXTRACTION METALLURGY
SUBJECT  : MINERAL PROCESSING III
CODE     : MPR 32 – 1
DATE     : WINTER EXAMINATIONS 2016
           09 JUNE 2016
DURATION : (SESSION 2). 12:30– 15:30
WEIGHT   : 40: 60
TOTAL MARKS : 100
EXAMINER : DR W. NHETA
MODERATOR : MR M. HENDERSON
NUMBER OF PAGES : 3 PAGES
INSTRUCTIONS : ANSWER ALL QUESTIONS.
               DRAW NEAT DIAGRAMS AND WRITE CLEARLY.
               MARKS CAN BE DEDUCTED FOR UNTIDY WORK.
               FOR THE CALCULATION QUESTIONS, PUT ALL YOUR FINAL
               ANSWERS AT THE END OF EACH QUESTION.
               ENSURE THEY ARE CORRECTLY NUMBERED.
               USE 4 DIGITS IN ALL CALCULATIONS UNLESS STATED
               OTHERWISE.
               PUT ALL YOUR WORKING IN THE SCRIPT.
               NO VISIBLE WORKING IN THE SCRIPT MEANS NO MARKS
               WILL BE AWARDED.
Question 1

The feed to a cyclone in a milling circuit consists of gold, pyrite and silica. Of the total gold, 85% is free and 15% is intimately associated with the pyrite. The solids feed rate to the cyclone is 250t/hr and they contain 6% pyrite. The feed rate of total gold to the cyclone is 48Kg/day and the cyclone overflow gold flowrate is 16.32Kg/day. 65% of the pyrite in the cyclone feed reports to the cyclone underflow. The grade of free gold in the cyclone underflow is 8.036g/t.

Find:-

1.1 Total Gold Grade in the cyclone feed solids in g/t
1.2 Solids flowrate to the cyclone underflow
1.3 % Pyrite in the Cyclone underflow
1.4 Grade of Free Gold in the cyclone overflow in ppm
1.5 Grade of Pyrite in the cyclone overflow
1.6 Grade of Pyrite Gold in the cyclone overflow in g/t

[25]

Question 2

A flotation plant is treating an ore containing pentlandite (NiFeS) and siliceous gangue (SiO₂). The circuit consists of a rougher bank, followed by a scavenger bank. The scavenger concentrate is cleaned in a scavenger cleaner bank. The scavenger cleaner concentrate joins the rougher concentrate to form the cleaner feed. The cleaner bank produces the final concentrate. None of the tailings are re-circulated.

The following information is available-

- The Factor of Ni in pentlandite is 0.400
- The Factor of S in pentlandite is 0.219
- The rougher tailings have a mass of 173t/hr and have a grade of 1.024% pentlandite.
- The rougher concentrate has a grade of 29.5%Ni
- The rougher feed grade is 2.8%Ni
- The scavenger tailings grade is 0.094%Ni.
- The mass of the scavenger concentrate is 10t/hr
- The % Ni recovery across the scavenger cleaner is 91.42%
- The cleaner feed mass is 18.025t/hr
- The cleaner feed is upgraded by a factor of 1.6 times into the cleaner concentrate.
- The % pentlandite recovery across the cleaner stage is 98%

Calculate the following:
2.1 the t/hr Mass of the feed. (3)
2.2 the t/hr pentlandite in the rougher feed  
2.3 the %S in the scavenger concentrate  
2.4 the %Ni in the scavenger cleaner concentrate  
2.5 the %S in the scavenger cleaner tailings  
2.6 the %Ni in the cleaner feed.  
2.7 the % Ni recovery to the final concentrate from the rougher feed  
2.8 the mass of the final concentrate  

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Question 3

3.1 Discuss the application of the sink/float principle to gravity separation of minerals with reference to a typical circuit, the nature of the medium and the function of the equipment used for such a separation.  

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Question 4

4.1 Describe the operation of a high tension separator and the principles involved.  
4.2 An electrostatic separator performs a similar task. What are the differences between that and the high tension separator in terms of its construction and method of operation.  

(9)  

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Question 5

5.1 Discuss how you would obtain a good sample on a plant.  

[15]