



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SCH 323: UNIT OPERATIONS II

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DATE: MONDAY 2ND APRIL 2012

TIME: 8.00 A.M. – 10.00 A.M.

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INSTRUCTIONS

Answer ALL Questions

- Q.1 a) Distinguish between
- i) Fluid statics and fluid dynamics (1 ½ marks)
 - ii) Fluid mechanics and continuum mechanics (1 ½ marks)
 - iii) Compressible fluids and incompressible fluids (2 marks)
- b) i) What is viscosity?
- ii) Find the kinematic viscosity of an oil whose specific gravity is 0.96 and viscosity 0.00109 N-s/m² (3 marks)
- iii) Explain turbulent flow (3 marks)
- iv) Write Reynold's Number equation and give the meaning of the terms involved. (2 marks)
- c) With the help of a diagram, explain the awake formation. Give also three ways by which energy loss by awake formation can be prevented. (7 marks)

(Total 20 marks)

- Q.2 a) State the Law of continuity (1 ½ marks)
- b) Develop the equation of continuity for a fluid flowing in a rectangular system. (7 marks)
- c) Give also the continuity equation for a fluid whose density is constant. (1 ½ marks)

- Q.3 a) i) Name three types of impellers (1 ½ marks)
- ii) State the factors on which the type of flow in an agitated tank depends (2 ½ marks)
- b) i) With the help of a diagram, briefly describe the patterns of flow in an agitated vessel. (4 marks)
- ii) What are the three methods by which circulatory and swirling can be prevented during agitation. (2 marks)

- Q.4 a) With the help of a diagram, describe briefly the agitation equipment (4 marks)
- b) A flat plate turbine with six blades is installed centrally in a vertical tank. The tank is 6 ft in diameter, the turbine is 2ft in diameter and is positioned 2ft from the bottom of the tank. The turbine blades are 6in wide. The tank is filled to a depth of 6ft with a solution of 50 percent caustic soda, at 150° F, which has a viscosity of 12cp at a density of 93.5 lbs/ft³. The turbine is operated at 90 r/min. The tank is baffled

Calculate

- a) Reynold's Number (N_{Re}).
- b) The power required to operate the mixer if at $N_{Re} = 96\,600$, $NP = 6.0$ (6 marks)

- Q.5 a) i) What are valves?
ii) Name four types of valves (3 marks)

- b) Explain the working of
i) Reciprocating pumps (4 marks)
ii) Centrifugal pumps (3 marks)

- Q.6 a) What are the factors considered for optimum size of pipe selection? (2 marks)

- b) Benzene at 100°F is pumped through the system at a rate of 40 gal/min. the reservoir is at atmospheric pressure. The gauge pressure at the end of the discharge is 50 lbf/in². The discharge is 10ft and the pump suction 4ft above the level of the reservoir. The discharge line is 1 ½ in schedule 40 pipe. The friction in the suction line is known to be 0.5lbf/in² and that in discharge line is 5.5 lbf/in². The mechanical efficiency of the pump is 0.60 (60 percent). The density of benzene is 54lb /ft³.

Calculate

- a) the developed head of the pump
b) the total power input (8 marks)