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# SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

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**Higher National Diploma in Building Services Engineering**  
**Third Year, Second Semester Examination – 2016**  
**BSE 3201 – Piped Distribution Services**

Instructions for Candidates:  
Answer **only four** questions  
All questions carry equal marks

No. of questions : 05  
No. of pages : 02  
Time : 02 hours

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1)

a) Name two fundamental laws related to the flow of a fluid through a pipe. **(10 marks)**

b) A pump delivers water to a tank through a pipe with a bore of 30mm. If the water flow rate is  $1.6 * 10^{-3} \text{ m}^3/\text{s}$ , find the pressure at a point (point 1) in the pipe just after the pump. The density of water is  $1000 \text{ kg/m}^3$  and the loss of pressure due to friction is 52 kpa. Consider the datum level as point 1 and the water surface of the tank from the point 1 is above 30m.

(Take  $g = 10 \text{ ms}^{-2}$ )

**(15 marks)**

2)

a) Write five (05) assumptions generally made, when considering an ideal fluid flow through a nozzle. **(10 marks)**

b) A horizontal nozzle discharges water into the atmosphere. The cross sectional areas at the inlet and exit are  $580\text{mm}^2$  and  $180\text{mm}^2$  respectively. Calculate the flow rate when the inlet pressure is 410 pa. Assume that there is no energy loss. **(15 marks)**

3)

a) Mention the differences to be considered, when analyzing a fluid flow through a horizontal pipe line and an inclined pipe line. **(05 marks)**

b) Oil at 20°C (Density is 888 kg/m<sup>3</sup> and viscosity is 0.8 kg/ms) is flowing steadily through a 5cm diameter 42m long pipe. The pressures at the pipe inlet and outlet are measured as 742 and 95 kpa respectively. Determine the flow rate of oil through the pipe assuming the pipe is,

i) Horizontal

ii) Inclined 20° upward

iii) Inclined 20° downward.

iv) Verify that the flow through the pipe is laminar. **(20 marks)**

4)

a) Explain the characteristics of a real fluid flow through a pipe. **(05 marks)**

b) Explain what is,

i) Energy Grade Line (EGL)

ii) Hydraulic Grade Line (HGL) **(10 marks)**

c) Describe with rough sketches,

i) Laminar fully developed flow

ii) Turbulent fully developed flow **(10 marks)**

5)

a) State Poiseuille's equation and describe the required conditions to apply that equation. **(10 marks)**

b) Oil flows in a pipe of 76 mm bore diameter with a mean velocity of 0.4 m/s. The density is 895 kg/m<sup>3</sup> and the viscosity is 0.08 Ns/m<sup>2</sup>. Show that the flow is laminar and hence deduce the pressure loss per meter length. **(15 marks)**