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**University Examinations 2016/2017**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING.

**EMT 3200: FLUID MECHANICS**

**DATE: DECEMBER, 2016 TIME: 2 HOURS**

**INSTRUCTIONS: -** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. State five characteristics of surface tension. (5 marks)
2. Calculate the density, specific weight and weight of one litre of petrol of specific gravity=0.7. (5 marks)
3. A U tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipeline to the pipe and the right limb opened to the atmosphere. The centre of the pipe is 100 mm below the level of mercury of specific gravity 13.6 in the right limb. If the difference in mercury level in the two limbs is 160 mm, determine the absolute pressure of oil in the pipe. (10 marks)
4. An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives readings of 19.62N/cm2 and 9.81N/cm2 respectively. Coefficient of discharge of the meter is given as 0.6. Find the discharge of water through pipe. (10 marks)

**QUESTION TWO (20 MARKS)**

1. Show that the centre of pressure of a vertical plane surface submerged in liquid is given by :

 (10 marks)

1. Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4 m and altitude 4 m when it is immersed vertically in an oil of specific gravity 0.9. The base of the plate coincides with the free surface of oil. (10 marks)

**QUESTION THREE (20 MARKS)**

1. Distinguish between meta-centre and metacentric height. (5 marks)
2. A rectangular pontoon is 5 m long, 3 m wide and 1.20 m high. The depth of immersion of the pontoon is 0.80 m in sea water. If the centre of gravity is 0.6 m above the bottom of the pontoon, determine the metacentric height. The density for sea water =1025 kg/m3. (15 marks)

**QUESTION FOUR (20 MARKS)**

1. Distinguish between laminar and turbulent flow in pipes. (5 marks)
2. The diameter of a pipe gradually reduces from 1m to 0.7 m as shown in the figure below. The pressure intensity at the centre-line of 1 m section 7.848 kN/m2 and rate of flow of water through the pipe is 600 litres/s. Find the intensity of pressure at the centre-line of 0.7 section. Also determine the force exerted by flowing water on transition of the pipe (15 marks)