

Reg. No. _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

ME200: FLUID MECHANICS AND MACHINERY (AN, AU, IE, MP, PE)

Max. Marks:100

Duration: 3 Hours

Part A

(Answer any three questions)

1. a) Define specific weight and specific volume. Give its SI units. (3)
b) If 8 m^3 of certain oil weighs 4000 kg(f). Calculate the specific weight, mass density and specific gravity of the oil. (4)
c) State Newton's law of viscosity and what are newtonian fluids. (3)
2. a) Derive the expression for capillary rise in a tube. (5)
b) The capillary rise in the glass tube does not exceed 0.3 mm of water. Determine the minimum diameter, given that surface tension for water in contact with air is 0.0725 N/m. (5)
3. a) What is the significance of Pascal's law and prove it. (5)
b) The left limb of a simple U Tube manometer containing mercury is open to atmosphere while the right limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 15 cm below the level of mercury in the left limb. Find the pressure of fluid in the pipe if the difference of mercury level in two limbs is 24 cm. (5)
4. a) Explain the concept of Metacentre and Buoyancy. (5)
b) Determine the total pressure on a circular plate of diameter 1.8 m which is placed vertically in water in such a way that the centre of plate is 4m below the free surface of water. Find the position of centre of pressure also. (5)

Part B

(Answer any three questions)

5. a) Define Reynold's number and how are the flows classified according to Reynolds number in a closed pipe. (4)
b) Derive the expression for head loss due to friction or major losses in pipes. (6)
6. a) State the laws of fluid friction applicable to laminar and turbulent flows. (5)
b) Define Pathline and streamline. (5)
7. a) Explain about the drag force on a flat plate due to boundary layer. (5)

- b) What are the different regions of the flow of fluid in neighbourhood of solid boundary according to boundary layer theory? (5)
8. a) Derive the expression for discharge of venturimeter. (6)
- b) An orifice meter with orifice diameter 8 cm is inserted in a pipe of 20 cm diameter. The pressure gauge fitted in the upstream and downstream of the orifice meter shows a reading of 21.45 N/cm^2 and 9.95 N/cm^2 respectively. Find the discharge of water through the pipe. Take the value of coefficient of discharge as 0.64. (4)

Part C

(Answer any four questions)

9. a) A jet of water 75 mm in diameter having a velocity of 20 m/s strikes a series of the flat plates arranged around the periphery of a wheel such that plate appears successively before the jet. If the plates are moving at a velocity of 5 m/s. Compute the force exerted by jet on plates. (5)
- b) Derive the expression for force exerted by jet on stationary inclined plate. (5)
10. a) How are turbines classified in general? Describe in detail about the different classifications. (7)
- b) What is a draft tube and describe its purpose in a turbine system (3)
11. Discuss the constructional features of an axial flow reaction turbine with neat sketch of the entire unit and parts. (10)
12. Illustrate the working principle of a singularity reciprocating pump and describe its parts with necessary sketches. Also mention the equations for discharge and work done. (10)
13. a) What are the important functions of multistage centrifugal pumps? Describe any one function in detail with necessary sketches. (7)
- b) Define specific speed of a centrifugal pump. Give its equation. (3)
14. a) Define the following in cases of a centrifugal pump- Manometric efficiency, Mechanical Efficiency. (5)
- b) What is the need for priming in a centrifugal pump? (5)
