Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Petroleum Refinary Engineering) (2013 Onwards) (Sem.–3)

FLUID FLOW

Subject Code : BTPC-302

M.Code : 72191

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Q.1 Answer briefly :

(a) What is the difference between specific gravity and mass density?

(b) What is the unit of force in SI and FPS system?

(c) Explain the different type of fluid based on rheological diagram.

(d) Write down the statement of Buckingham II method.

(e) What is Buoyancy? How to calculate the buoyancy force?

(f) How to differentiate positive displacement and centrifugal pump?

(g) Explain Mach number with its significance.

(h) Explain the concept of path and stream lines.

(i) What are the major assumptions taken in Navier-Stokes equation?

(j) How the concept of dimensional analysis helps in scale-up process.

SECTION-B

Q.2 If the velocity profile of a fluid over a plate is parabolic ($u = ay^2 + by + c$ where a, b, c are constant) with the vertex 20 cm from the plate, where the velocity is 120 cm/sec. Calculate the velocity gradients and shear stresses at a distance of 0, 10, 20 cm from the plate, if the viscosity of the fluid is 8.5 poise.

Q.3 Explain the concept of Boundary layer theory.

Q.4 Derive the rational equation through Buckingham pi-method for a pipe flow having the following quantities affecting the flow phenomenon-

F the unit boundary friction against which the fluid flows; μ the viscosity; ρ the mass density; V the velocity of flow; D the pipe diameter; *t* the pipe surface roughness.

Q.5 Pressure gauge B is to measure the pressure at point A in a water flow. If the pressure at B is 87 kPa, estimate the pressure at A, in kPa. Assume all fluids are at 20°C. Data: specific weight of water, mercury and oil are 9790, 133100 and 8720 N/m^3 respectively.

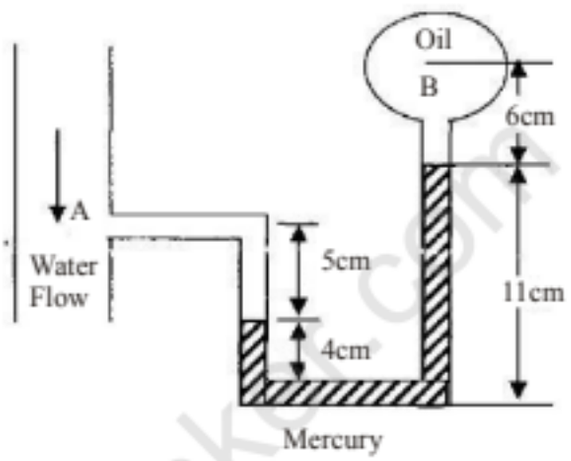

Fig.1

Q.6 Find the Mach number of a rocket travelling in standard air with a speed of 1600km/h at 15°C.

SECTION-C

Q.7 (a) What is NPSH? How to calculate it?

(b) Derive the expression for Euler equation of motion.

Q.8 The water is flowing through a pipe having diameters 20 cm and 10 cm at section 1 and section 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2.

Q.9 A centrifugal pump rotating at 1000 rpm delivers 160 litres/s of water against a head of 30 m. The pump is installed at a place where atmospheric pressure is 1×105 Pa (abs.) and vapour pressure of water is 3 k pa (abs). The head loss in suction pipe is equivalent to 0.2 m of water calculate :

(a) Minimum NPSH, and

(b) Maximum allowable height of the pump from free surface of water in the sump.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.