P P SAVANI UNIVERSITY

Fourth Semester of B. Tech. Examination
May 2019
SECH2050 Momentum Transfer

15.05.2019, Tuesday   Time: 09:00 a.m. To 11:30 a.m.   Maximum Marks: 60

Instructions:
1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1   **Multiple Choice Questions**   **[05]**

(i)   The unit of pressure one bar is
(A) 1 Pascal
(B) 1 kilo Pascal
(C) 100 kPascal
(D) 1000 kPascal

(ii)   The dynamic viscosity of a liquid is 1.2×10^{-4} Ns/m², whereas, the density is 600 kg/m³. The kinematic viscosity in m²/s is
(A) 72×10^{-3}
(B) 20×10^{-8}
(C) 7.2×10^{3}
(D) 70×10^{6}

(iii)   The continuity equation is the result of application of the following law to the flow field
(A) First law of thermodynamics
(B) Conservation of energy
(C) Newton's second law of motion
(D) Conservation of mass

(iv)   The location of the centre of pressure over a surface immersed in a liquid is
(A) always above the centroid
(B) will be at the centroid
(C) will be below the centroid
(D) for higher densities it will be above the centroid and for lower densities it will be below the centroid

(v)   Reynolds number signifies the ratio of
(A) gravity forces top viscous forces
(B) inertial forces to viscous forces
(C) inertia forces to gravity forces
(D) buoyant forces to inertia forces

Q - 2 (a)   Discuss Rayleigh method for application of dimensional analysis to fluid flow.   **[05]**

Q - 2 (b)   Find the position of centre of buoyancy for a wooden block of width 3.5 m and depth 1 m, when it floats horizontally in water. The density of wooden block is 850 kg/m³ and its length 7.0 m.   **[05]**

OR

Q - 2 (a)   What is boundary layer? Explain with an example of flat plate.   **[05]**

Q - 2 (b)   Calculate the critical velocity of water flowing through 25 mm i.d. pipe.   **[05]**
Data: Density of water= 1000 kg/m³ Viscosity of water= 0.0008 (Ns)/m²

Q - 3 (a)   A pipe 300 m long has a slope of 1 in 100 and tapers from 1.2 m diameter at high end to 0.6 [05]
m diameter at the low end. Water is flowing at a rate of 90 l/s. If the pressure at the high
end is 68.67 kPa, find the pressure in kPa at the lower end. Neglect the losses.

Q - 3 (b)   A kerosene storage tank drains by gravity to a tank truck. The pipeline between the tank [05]
and the truck is of 60 m length and of 25 mm internal diameter. Both tank and truck are
open to atmosphere. The flowrate of kerosene through the pipeline is 800 cm³/s. Calculate
the difference between the level in the tank and that in the truck.

OR

Q - 3 (a)   Derive the Bernoulli Equation for incompressible fluid without fluid friction. [05]

Q - 3 (b)   A fluid is flowing through a 5 cm diameter pipe at a velocity of 2 m/s. Suddenly it enters [05]
into a larger cross-sectional part of the pipe having diameter of 10 cm. Calculate the
frictional loss due to sudden expansion of the flow area.

Q - 4   **Attempt any one.** [05]
(i)   Derive Hagen Pouissuille Equation.
(ii)   Derive the expression for equation of continuity.

SECTION – II

Q - 1   **Answer the following (Any Five)** [05]
(i)   What is incompressible flow.
(ii)   Write the assumption of compressible flow.
(iii) Write the basic equation of compressible flow.
(iv)   Write Bernoulli's equation.
(v)   Write momentum equation.
(vi)   Define: Mach number.
(vii) Define Sonic flow, Sub-sonic flow and Super-sonic flow.

Q - 2 (a)   Derive Bernoulli's equation for isothermal process. [05]
Q - 2 (b)   Calculate the mach number at a point on a jet propelled aircraft, which is flying at 1100 [05]
Km/hr at sea-level where air temperature is 20 °C. Take k = 1.4 and R = 287 J/Kg °K.

OR

Q - 2 (a)   Explain construction and working of centrifugal pump, draw neat sketch. [05]
Q - 2 (b)   What is NPSH, explain in detail with the help of Bernoulli's equation. [05]
Q - 3 (a)   Explain construction and working of reciprocating pump with net sketch. [05]
Q - 3 (b)   Explain construction and working of piston pump with net sketch. [05]

OR

Q - 3 (a)   List out the various losses during the operation of centrifugal pump. [05]
Q - 3 (b)   Explain in detail the principle and construction of venturi meter with neat sketch. [05]
Q - 4   **Attempt any one.** [05]
(i)   Draw the neat sketch of control valve and gate valve.
(ii)   Explain fluidization in detail.

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