Code No. 6065 / M

FACULTY OF ENGINEERING

B.E. 2/4 (M/P) II – Semester (Main) Examination, June 2014

Subject: Fluid Dynamics

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

1	State and briefly explain Newton's law of viscosity.	3
2	Write the relation between absolute pressure, atmospheric pressure and gauge pressure.	2
3	Explain the characteristics of laminar and turbulent boundary layers.	3
4	Why should circulation superimposed on flow past a body cause a lift?	2
5	A jet propelled aircraft is flying at 1100 km/hr at sea level, calculate the Mach number at a point on the aircraft where air temperature is 20^{o}C. (R=287 J/kg ^{o}K and K=1.4).	2
6	Differentiate between local acceleration and convective acceleration with equations.	2
7	Draw a neat sketch of Pitot tube and explain about its working principle.	3
8	Explain the terms Hydraulic Gradient Line (HGL) and Total Energy Line (TEL).	2
9	A liquid has a specific gravity of 1.9 and kinematic viscosity of 6 stokes. What is its dynamic velocity?	3
10	Define Mach number, explain with a neat sketch about Mach Cone.	3

PART – B (50 Marks)

11	(a)	Explain briefly the following terms: i) Mass density ii) Weight density iii) Specific gravity iv) Dynamic viscosity v) Kinematic viscosity.	5
	(b)	A 2-dimensional flow is described by the velocity components u = $6x^3$ and V = $-16x^2y$. Determine the stream function, velocity potential function and acceleration at a point P(1,2).	5
12	(a)	Derive Euler's equation of motion. While listing out the assumptions made while deriving Bernoulli's equation, state and derive Bernoulli's equation.	5
	(b)	A 60^{o} reducing bend is connected in a pipe line, the diameter at inlet and outlet of the bend being 50 cm and 25 cm respectively. Find the force exerted by the water on the bend if the intensity of pressure at inlet of the bend is 200 kN/m^2. The rate of flow is 1 m^3/s.	5
13	(a)	Derive Darcy's Weisbach equation for the loss of head due to friction in a pipe with the aid of neat sketch.	5
	(b)	In a pipe of 200 mm diameter, the maximum velocity of flow is found to be 1.5 m/s. If flow in the pipe is laminar, find (i) the average velocity and the radius at which it occurs, and (ii) the velocity at 40 mm from the wall of the pipe.	5

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14 (a) What do you mean by boundary layer separation? What is the effect of pressure gradient on boundary layer separation? Explain with the aid of neat sketch. 5

(b) Experiment is conducted in a wind tunnel with a speed of 50 km/hr in a flat plate of size 1 m long and 1 m wide. The mass density of air is 1.15 kg/m^3. The plate is kept at such an angle that coefficients of lift and drag are 0.75 and 0.15 respectively. Determine (i) Lift force (ii) Drag force (iii) Resultant force (iv) Power exerted by the air stream on the plate. 5

15 (a) Derive Bernoulli's equation for compressible flow when the process is adiabatic. 5

(b) A supersonic plane flies at 1900 KMPH in air having a pressure of 28.5 KPa(abs) and density of 0.439 kg/m^3. Calculate (i) Temperature (ii) Pressure (iii) Density of air at stagnation point on the nose of the plane. (Take K = 1.4 and R = 278 J/kg ^oK). 5

16 (a) Derive the equation of continuity in One - Dimensional flow by assuming the flow as incompressible. 5

(b) What is Venturimeter? Derive an expression to estimate the discharge. 5

17 Write a short note on any three.

a) Symmetrical and unsymmetrical airfoils.
b) Reynolds experiment.
c) Flownet and its uses.
d) Factors affecting boundary layer.

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