D 42016 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2007

ME/AM 04 303—FLUID MECHANICS

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Difference between Newtonian fluids and non-Newtonian fluids.

(b) Differentiate between absolute and gauge pressure.

(c) Differentiate between (i) streamline (ii) streakline (iii) stream tubes.

(d) Explain about velocity correction factor.

(e) Explain about critical Reynold's number. Which is the true critical Reynold's number ?

(f) Differentiate between Eulerian and Lagrangian approaches of fluid flow.

(g) Explain Prandtl's mixing length concept.

(h) Explain about drag and life.

(8 × 5 = 40 marks)

II. (a) The relative density of a fluid is 1.26 and its dynamic viscosity is 1.50 kg/ms. Calculate its (i) specific weight (ii) kinematic viscosity.

(b) Two discs of 20 cm diameter are placed 1mm apart and gap is filled with an oil of viscosity 8 kg/ms. Determine power required to rotate upper disc at 600 r.p.m. while holding the lower one stationary.

Or

III. (a) Derive differential equation of pressure for static fluid. (7 marks)

(b) Find the pressure represented by a column of (i) 10 cm of water (ii) 5 cm of oil of relative density .75 (iii) 2 cm of mercury.

(8 marks)

IV. (a) Derive Bernoulli's Equation by clearly stating its assumptions. (10 marks)

(b) Explain limitations of Bernoulli's theorem. (5 marks)

Or

V. (a) Derive the equation for discharge in a venturimeter. (7 marks)

(b) A pitot tube is mounted on an airplane to indicate speed of plane relative to wind. What differential pressure in kPa will instrument register when plane is travelling at a speed of 200 km/hr in a wind of 60 km/hr the blowing against the direction of plane.

(8 marks)

Turn over

VI. (a) Derive Darcy Weibach equation. (8 marks)

(b) Explain about minor losses. (7 marks)

Or

VII. The velocity of a nozzle of length l along centerliner is $v = 2t\left(1-\frac{x}{2l}\right)^2$ where v is the velocity in m/sec, x is the distance from inlet to nozzle and t is the time in seconds. Find convective acceleration, local acceleration and total acceleration when $t = 3$ secs, $x = .5$m and $l = .8$m. (15 marks)

VIII. (a) Describe, boundary layer growth on a flat plate held parallel to flow. (7 marks)

(b) A 1.8 m wide and 5 m long plate moves through stationary air of density 1.22 kg/m^3 and viscosity 1.8×10^{-4} poise at a velocity of 1.75 m/s parallel to its length. Determine drag force on one side of plate by assuming (i) Laminar flow (ii) Turbulent flow. (8 marks)

Or

IX. A 20 km/hr wind blows over a flat plate. If the density and kinematic viscosity of air are 1.2 kg/m^3 and 1.5×10^{-5} m^2/sec. Find force per metre width of the plate. Also estimate thickness of boundary layer at trailing edge ? (15 marks)

(4 × 15 = 60 marks)