

**2005 JAWAHARLAL NEHRU TECHNOLOGY UNIVERSITY**

II B.TECH I SEMESTER SUPPLYMENTARY EXAMINATIONS

**FLUID MECHANCS**

(MECHANICAL ENGINEERING AND PRODUCTION ENGINEERING)

MAY 2005

TIME: 3 HOUR  
MARK: 80

ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS

MARK [ 5\*16=80 ]

1. (a) Derive the equation for total pressure and centre of pressure for vertical plane surface.  
(b) If the velocity profile of a fluid over a plate is a parabolic 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 and 20 cm from the plate, if the viscosity of the fluid is 8.5 poise.
2. (a) Define stream line and path line. Show that stream lines and equipotential lines are orthogonal to each other.  
(b) Explain the characteristics of stream function and velocity potential functions?
3. (a) Derive Euler's equation of motion and along a stream line with usual notations.  
(b) An open circular cylinder of 15 cm diameter and 100 cm long contains water upto a height 80 cm. Find the maximum speed at which the cylinder is to be rotated about its vertical axis so that no water spills.
4. (a) Explain the characteristics of boundary layer along a thin flat plate with a neat sketch.  
(b) Define
  - i. Aerofoil
  - ii. Drag and lift forces
  - iii. Pressure and form drags
5. (a) Derive the expression for stagnation pressure and stagnation density.  
(b) Define MACH NUMBER and write the classification of flows based on MACH NUMBER and also derive the equation for MACH NUMBER.
6. (a) Derive the equation of Reynolds number and write the classification of flows based on Reynolds number for pipes.  
(b) A laminar flow is taking place in a pipe of diameter of 20cm. The maximum velocity is 1.5m/s. Find the mean velocity and the radius at which this occurs. Also calculate the velocity at 4cm from the wall of the pipe.
7. (a) Derive Darcy Weibach equation, for turbulent flow with usual notations.  
(b) Distinguish between pipes in series and pipes in parallel with neat sketches.
8. (a) Derive the equation of discharge over a triangular notch with usual notations.  
(b) Write short notes on:
  - i. Manometers
  - ii. Viscometers
  - iii. Pressure gauges.