Registration No :

Total Number of Pages : 02   **B.Tech**
                                                                                  BEME2209

4th Semester Back Examination 2017-18
FLUID MECHANICS AND MACHINES
BRANCH : AEIE, EIE, ELECTRICAL, IEE
Time : 3 Hours
Max Marks : 70
Q.CODE : C1175
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1   **Answer the following questions:**   **(2 x 10)**
a) Define compressibility and Bulk modulus.
b) A plate 0.003 mm distance from a fixed plate, moves at 60 m/s and requires a force of 2 N /m^2 to maintain this speed. Determine the fluid viscosity between the plates.
c) Find the pressure inside a water drop 2mm in diameter if the atmospheric pressure is 101.3kN/m^2 and surface tension of water is 0.07N/m.
d) What is metacentric height of a body? Why is it a important consideration for a body?
e) Differentiate between stream line and streak line.
f) When the pressure of the liquid increased from 2MPa and the corresponding decrease in volume is found to be 0.1%. Determine bulk modulus of elasticity of fluid.
g) Write the expression for equation of continuity in differential form?
h) Differentiate between runaway speed and synchronous speed of a hydraulic turbine.
i) What is meant by overall efficiency of turbine?
j) What is Reynolds number and what is its significant?

Q2 **a)** Derive continuity equation for 3-D Cartesian system.   **(5)**
      b) A 2-D incompressible flow, the fluid velocity components are given by u=x- 4y, v=-y-4x.Show that velocity potential exists and find its form as well as stream function.   **(5)**

Q3 **a)** A caisson for closing the entrance to a dry dock is of trapezoidal form 16m wide at the top and 10m wide at the bottom and 6m deep. Find the total pressure and centre of pressure on the caisson if the water on the outside is just level with the top and dock is empty.   **(5)**
      b) A wooden cylinder of diameter 'd' and length '2d'floats in water with its axis vertical. Is the equilibrium is stable? Locate the metacentre with reference to water surface. Specific gravity of wood is 0.6.   **(5)**

Q4 **a)** Define specific speed of turbine? Derive expression for specific speed. **(5)**

b) The inlet and throat diameter of a horizontal venturimeter are 30cm and 10cm **(5)** respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.734N/cm^2 while the vacuum pressure at throat is 37cm of mercury. Find the rate of flow, assume that 4% of the differential head is lost between the inlet and throat. Find the value of C_d for the venturimeter.

Q5 **a)** Explain in detail the performance curves for turbine. **(5)**

b) A pelton wheel has a mean bucket speed of 10 meters per second with a jet **(5)** of water flowing at the rate of 700 litres/s under a head of 30 meters. The buckets deflect the jet through an angle of 160°. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98.

Q6 **a)** Differentiate between reciprocating pump and centrifugal pump. **(3)**

b) A centrifugal pump with 1.2m diameter runs at 200 rpm and pumps 1900 **(7)** liters/sec, the average lift is 6m. The angle which the vanes makes at exit with the tangent to the impeller is 20° and the radial velocity of flow is 2.5m/sec. Determine the manometric efficiency and the least speed to start pumping against a head of 6m, The inner diameter of the impeller being 0.6m.

Q7 The hub diameter of a Kaplan turbine, working under a head of 12m, is 0.35 **(10)** times the diameter of the runner. The turbine is running at 100 rpm. If the vane angle of the extreme edge of the runner at outlet is 15° and flow ratio 0.6. Find :

(i) diameter of the runner, (ii) diameter of the boss and (iii) discharge through the runner. The velocity of whirl at outlet is given as zero.

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Pitot tube and Venturimeter
b) Hydraulic Crane
c) Hydraulic Accumulator
d) Governing of turbine