Register Number.....

B.E. DEGREE EXAMINATIONS: OCTOBER / NOVEMBER - 2008

Third Semester

(Common for Aeronautical and Mechanical Engineering)

U07ME303: FLUID MECHANICS AND MACHINERY

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions: -

PART A (20 x 1 = 20 Marks)

1. The property of a fluid which offers resistance to the movement of one layer of fluid over another adjacent layer of the fluid is called as

   (a)Viscosity (b) Specific gravity (c) Friction (d) Flow ability

2. The unit of Kinematic Viscosity is

   (a) N-sec/m^2. (b) m^2/sec. (c) m/sec. (d) N/sec

3. The Specific Weight of 1 litre of a liquid which weighs 8N is

   (a) 80 N/m^3. (b) 800 N/m^3 (c) 8000 N/m^3 (d) 8 N/m^3

4. Paint is an example for

   (a) Reynolds fluid. (b) Darcy's fluid.

   (c) Newtonian fluids. (d) Non-Newtonian fluids

5. The Reynolds number 2000 is specified for

   (a) Laminar flow, (b) Laminar or turbulent flow, (c) Turbulent flow, (d) Backflow

6. A grid obtained by drawing a series of equipotential lines and stream lines is called

   (a) Internet, (b) Flow net, (c) Grid, (d) Flow

7. The four assumptions flow is ideal, steady, irrotational, and incompressible is used for

   (a) Hagen equation (b) Darcy's equation (c) Bernoulli's equation (d) Drag equation

8. Pitot tube is used to measure

   (a) Pressure (b) Flow (c) Viscosity (d) Velocity at a point

9. The type of flow in which the density is constant for the fluid flow is defined as

   (a) Incompressible flow (b) Compressible flow

   (c) Reversible flow (d) Flow net

10. The Darcy-Weisbach equation is commonly used to calculate the loss of head due to

    (a) Loss (b) Friction in pipe line (c) Free flow (d) Rotational flow

11. The equation $F_D = C_D A(\rho U^2/2)$ is used to calculate the

(a) Frictional force (b) Lift force (c) Drag force (d) Vertical force

12. The boundary layer separation takes place if

(a) Pressure gradient is zero (b) Reynolds number is zero

(c) Pressure gradient is negative (d) Pressure gradients is positive

13. The ratio between the kinetic energy changes in the moving blade to the kinetic energy change in the stage is defined as

(a) Degree of reaction (b) Mass density (c) Density (d) Kinetic energy

14. The head of water required for Kaplan turbine is

(a) 60m to 150m (b) Less than 60m, (c) Less than 1m (d) Above 250m

15. The Hydraulic machine which coverts hydraulic energy in to mechanical energy is

(a) Centrifugal pump (b) Reciprocating pump
(c) Turbine (d) Gear pump

16. The shape of buckets of Pelton wheel turbine is

(a) bucket (b) spear (c) nozzle (d) splitter

17 The surge tank in a pipe line is used to relieve the pressure due to

(a) Water hammer (b) Cavity (c) Priming (d) Leakage

18 The air vessel is used to produce uniform discharge from

(a) Centrifugal pump (b) Reciprocating pump
(c) Air pump (d) Vacuum pump

19 The speed of geometrically similar pump which will deliver unit quantity against a unit head is

(a) Actual speed (b) Maximum speed

(c) Specific speed of a pump (d) Low speed

20. The method of filling the water in the pump before it starts is called

(a) Suction b) cavitation c) filling d) priming

PART B (5 x 16 = 80 Marks)

21(a) (i) What is Bulk modulus of elasticity of a liquid which is compressed in a cylinder from a volume of 0.0125 m^3 at 80 N/cm2 pressure to a volume of 0.024 m^3 at a pressure of 150 N/cm^2.

(ii) The space flow 2 square flat parallel plates is filled with oil. Each side of plate is 60 cm. Thickness oil film is 12.5 mm. upper plate moves 2.5 m/s requires a force of 28.1N to maintain the speed. Determine Dynamic viscosity of oil and kinematic viscosity oil in stokes if the specific gravity of oil is 0.25.

(OR)

21(b) (i) Derive an expression capillary rise and define capillarity.

ii) Define: - Specific gravity, Dynamic viscosity, Kinematic viscosity

Compressibility, Specific weight

22(a) Derive Bernoulli's equation of motion for ideal fluid, stating the assumptions made. Also write the Bernoulli's equation for real fluid.

(OR)

22(b) If for a two dimensional potential flow, the velocity potential is given by

$\Phi = 4x(3y - 4)$, determine the velocity of the point (2,3). Determine also the value of stream function ψ at the point (2, 3).

23(a) The rate of flow of water through a horizontal pipe is $0.25 m^3/s$. The pipe diameter is 200mm which is suddenly enlarged to 400mm. The pressure intensity in the smaller pipe is $11.772 N/cm^2$. Determine i) loss of head due to sudden enlargement ii) pressure intensity in the large pipe iii) power lost due to enlargement.

(OR)

23(b) Obtain an expression for Hagen – Poiseuille flow. Deduce the condition for maximum velocity.

24(a) An outward flow reaction turbine has internal and external diameter of the runner as 0.5m and 1m respectively. The guide blade angle is 15° and flow velocity through runner is constant and equal to 3m/s. if the turbine speed is 250 rpm, head on turbine is 10m and discharge is radial at outlet, determine i) runner vane angles and inlet and outlet ii) work done by water on runner /sec/unit weight of water and iii) hydraulic efficiency.

(OR)

24(b) Draw the velocity triangle for a Pelton wheel and explain it. Derive the hydraulic efficiency for a Pelton wheel.

25(a) A single acting reciprocating pump has piston diameter 15cm and stroke length 30cm. the pump centre is 5m above water level in the sump. The diameter and length of suction pipe are 10cm and 8m respectively. Separation occurs if absolute pressure head in the cylinder falls below 2.5m of water. Calculate the maximum speed at which the pump can run without separation. $H_{atm} = 10.3m$ of water.

(OR)

25(b) (i) A centrifugal pump is to discharge $0.12 m^3$ at a speed of 1400 rpm against a head of 30m. The diameter and width of the impeller at outlet are 25cm and 5cm respectively. If the manometric efficiency is 75%, determine the outlet vane angle.

(ii) Define priming, Cavitation and brief the methods to prevent the cavitations.

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