Register Number: ……..

B.E DEGREE EXAMINATIONS: NOV / DEC 2010

Third Semester

MECHATRONICS ENGINEERING

U07MH302: Fluid Mechanics & Machinery

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

Answer All Questions:-

PART A (10 x 1 = 10 Marks)

1. The rate of increase of pressure in a vertical direction is equal to density of fluid is

   a) Pascal's Law b) Hydrostatic Law c) Newton's Law d) Hook's Law

2. Surface tension has the unit of

   a) Force / unit area b) Force / unit length c) Force / unit volume d) none of the above

3. The flow coming from a point and moving radially in all direction of a plane at uniform rate is

   a) Ideal flow b) Vortex flow c) Source flow d) Uniform flow

4. Continuity equation deals with the law of conservation of

   a) Mass b) Momentum c) Energy d) None of the above

5. Euler's number is the ratio of

   a) Inertia force to pressure force b) Inertia force to elastic force

   c) Inertia force to gravity force d) Inertia force to viscous force

6. The power transmitted thro pipe is maximum, when the head lost due to friction is

   a) One half of supply head b) One third of supply head

   c) One fourth of supply head d) Two third of supply head

7. The specific speed of a turbine is defined as the speed of turbine which

   a) Produces unit power at unit head b) Produces unit horse power at unit discharge

   c) Delivers unit discharge at unit head d) Delivers unit discharge at unit power

8. The maximum hydraulic efficiency of an impulse turbine is equal to

   a) $(1+\cos\phi) / 2$ b) $(1-\cos\phi) / 2$ c) $(1+\sin\phi) / 2$ d) $(1-\sin\phi) / 2$

9. Which of the following pump is suitable for small discharge & high heads?

   a) Centrifugal pump b) Axial pump c) Mixed flow pump d) Reciprocating pump

10. The slip of a reciprocating pump is

   a) Ratio of actual discharge to theoretical discharge

   b) Product of actual discharge to theoretical discharge

   c) Difference of actual discharge to theoretical discharge

   d) Sum of actual discharge to theoretical discharge

PART B (10 x 2 = 20 Marks)

11. State Newton's law of viscosity.
12. Define capillarity.
13. Why is C_d of orifice meter is much smaller than that of venturimeter?
14. A pitot tube is inserted in a pipe to measure the velocity of water in it. If the water rises in the tube is 200mm. Find the velocity of water.
15. What do you mean by Hagen-Poiseulle flow in pipes?
16. Define hydraulic gradient line.
17. Differentiate between axial flow & radial flow turbine
18. What is draft tube?
19. What is Priming?
20. Name the different types of casings for the impeller of a centrifugal pump.

PART C (5 x 14 = 70 Marks)

21. a) (i) The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90mm. the thickness of the oil film is 1.5mm. (8)

(ii) Explain briefly the working principle of bourdon pressure gauge with a neat sketch (6)

(OR)

b) (i) A Vessel of 4 m^3 volume contains an oil which weighs 30.2 KN. Determine the specific gravity of oil. (6)

(ii) Explain briefly the working principle of Deadweight Pressure gauge (8)

22. a) (i) State Bernoulli's theorem. Derive an expression for Bernoulli's equation of motion with assumption. (8)

(ii) The water is flowing through a pipe through a pipeline of 100mm diameter with an average velocity of 10m/s. Determine the discharge through the pipe in lps. (6)

(OR)

b) (i) An orifice meter consisting of 100mm diameter orifice in a 250 mm diameter pipe has coefficient equal to 0.65. The pipe delivers oil (Sp.gr.0.8). The pressure difference on the two sides of the orifice plate is measured by a mercury oil differential manometer. If the differential gauge reads 80 mm of mercury. Calculate the rate of flow in lps. (8)

(ii) Enumerate in detail about the different types of flow. (6)

23. a) (i) The water is flowing through a pipe of 200 mm diameter 60 m long with a velocity of 2.5 m/s. find the head lost due to friction by using

Darcy's formula assume f =0.005

Chezy's formula assume c = 55 (10)

(ii) Define the term Kinetic correction factor & Momentum correction factor. (4)

(OR)

b) (i) Find the head lost due to friction in a pipe of diameter 300 mm & length 50m through which water is flowing at a velocity of 3m/s using (9)

Darcy's formula

Chezy's formula assume c = 60

(ii) The water is flowing through the pipe of 1500m long with a velocity of 0.8 m/s. What should be the diameter of the pipe, if the loss of head due to friction is 8.7 m. Take f for the pipe as 0.01. (5)

24. a) With the neat sketch describe the procedure used for governing a turbine.

(OR)

b) A pelton wheel is to be designed for the following specifications

Shaft power = 11,772 Kw

Head = 380 m

Speed = 750 rpm

Overall Efficiency = 86%

Jet diameter is not to exceed one sixth of the wheel diameter. Determine

The wheel diameter

The Number of jets required

Diameter of the jet take $Kv_1 = 0.985$, $Ku_1 = 0.45$

25. a) (i) Explain the working principle of a centrifugal pump with neat sketch (9)

(ii) A single acting reciprocating pump has a plunger of 300mm diameter and stroke 200mm. If the speed of the pump is 30 rpm & it delivers 6.5 litres / sec of water. Find the C_d & % of slip of the pump. (5)

(OR)

b) A Centrifugal pump delivers 30 liters of water per second to a height of 18m through a pipe of 90 m long and 100m diameter. If overall efficiency of the pump is 75%. Find the power required to drive the pump take f = 0.012

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