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B.E (FULL TIME) DEGREE END SEMESTER EXAMINATION, NOV/DEC - 2011
COMMON TO MANUFACTURING AND INDUSTRIAL ENGINEERING BRANCH
IV SEMESTER - (REGULATION 2004)

CE 291 - FLUID MECHANICS AND MACHINERY

Time: 3 hours

Marks: 100

Part - A

10 x 2 = 20

Answer ALL questions

1. Define Specific weight and specific volume of a fluid.
2. Differentiate between atmospheric pressure and vapour pressure.
3. What is control volume in fluid flow?
4. List out the types of flow?
5. What are the types of boundary layer thickness?
6. Define Froude number and Reynolds number?
7. What is Pelton Wheel turbine and draw its components?
8. State the importance of priming in centrifugal pump.
9. What is meant by negative slip in reciprocating pump?
10. State the advantages of rotary pump.

Part - B

5 x 16 = 80

11. (i) Define Laminar flow and turbulent flow in pipe line? (4)
(ii) Derive from basic principle the Hagen-Poiseuille equation for laminar flow through circular pipe? (12)
12. (a)(i) Derive from fundamental dimensions, the dimension of dynamic viscosity and kinematic viscosity? (4)
(ii) Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size 0.8 m X 0.8 m and an inclined plane with angle of inclination 30 degree to horizontal. The weight of the square plate is 300 N. and slides down with uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm. (12)

(OR)

- (b)(i) Explain the phenomena of capillarity. Obtain an expression for capillary rise of a liquid? (8)
- (ii) Find the minimum size of glass tube that can be used to measure water level, if the capillary rise in the tube is to be restricted to 2 mm. Consider surface tension of water in contact with tube is 0.0738N/m. (8)

13. (a) (i) State Buckingham π theorem. (4)

(ii) Derive the relation using Buckingham π theorem. (12)

$$F = \rho U^2 D^2 f(\mu/(UD\rho), ND/U)$$

(OR)

(b) A 1:15 model of a boat is towed through water. The prototype is moving in sea-water of specific weight 1024 N/m^3 at a velocity of 20 m/s . Find the corresponding speed of the model. Also determine the resistance due to waves on model, if the resistance due to waves of prototype is 600 N . (16)

14. (a) (i) Distinguish between impulse turbine and reaction turbine. (4)

(ii) Sketch a typical layout of a centrifugal pump and indicate its various components. State the functions of each component part. (12)

(OR)

(b) A Pelton wheel nozzle gives a jet of 10.0 cm diameter and velocity 60 m/s . Coefficient of velocity is 0.98 . The pitch circle diameter is 2.0 m and the deflection angle of the buckets is 160 degree. The wheel velocity is 0.45 times the jet velocity. Estimate the speed of the Pelton wheel turbine, theoretical power developed and also the efficiency of the Pelton wheel (16)

15. (a) (i) Distinguish between rotodynamic pump and positive displacement pump with simple sketch (4)

(ii) Derive an expression for pressure head due to acceleration of the piston of a reciprocating pump, assuming motion of the piston to be S.H.M. (12)

(OR)

(b) (i) What is Air vessel and where it can be fixed? (4)

(ii) The cylinder bore diameter of a single acting reciprocating pump is 150 mm . and its stroke length is 300 mm . The pump runs at 50 rpm and lifts water through a height of 25 m . The delivery pipe is 22 m long and 100 mm . in diameter. Find the theoretical discharge and the theoretical power required to run the pump. If the actual discharge is 4.2 litres/s , find the percentage slip. (12)