

G 1547

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Fourth Semester

Branch : Mechanical Engineering/Production Engineering
ME 010 403/PE 010 403—HYDRAULIC MACHINES (ME, PE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. How the laminar flow is different from turbulent flow ?
2. Describe the classification of turbines.
3. What are the different types of casing used in centrifugal pump and explain any one type of casing ?
4. Explain the principle of similitude.
5. State the effect of vapour pressure on lifting of liquids.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Difference between impulse and reaction turbine.
7. Explain the various types of draft tube and their application.
8. State the Euler's head equation with an illustration.
9. Explain the term unit power, unit speed and unit discharge with reference to a turbine.
10. Explain the principle and working of a hydraulic intensifier.

(5 × 5 = 25 marks)

Part C

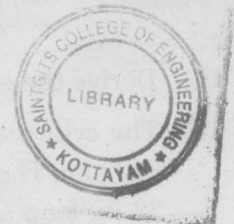
Answer all questions.

Each full question carries 12 marks.

11. Derive the force exerted by a jet of water on a fixed semi - circular plate in the direction of jet when, (i) The jet strikes at the centre of semi - circular plate (ii) The jet strikes the curved plate at one end tangentially when the plate is symmetrical.

Or

Turn over



12. A small ship is fitted with jets of total area 0.65 m^2 . The velocity through the jet is 9 m/s and speed of the ship is 18 Km/h in sea water. The efficiencies of the engine and pump are 85% and 65% respectively. If the water is taken amid - ships, determine the propelling force and the overall efficiency, assuming the pipe losses to be 10% of the kinetic energy of the jets.
13. With the help of neat diagram explain the construction and working of a pelton wheel turbine.

Or

14. A Kaplan turbine working under a head of 20 m . develops 11772 kW shaft power. The outer diameter of the runner is 3.5 m . and hub diameter is 1.75 m . The guide blade angle at the extreme edge of the runner is 35° . The hydraulic and overall efficiencies of the turbines are 88% and 84% respectively. If the velocity of the whirl is zero at outlet, Determine: (i) Runner vane angles at inlet and outlet at the extreme edge of the runner and (ii) Speed of the turbine.
15. A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m. Works against a total head of 40 m . The velocity of flow through the impeller is constant and equal to 2.5 m/s . The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm . and width at outlet is 50 mm . Determine (i) Vane angle at inlet, (ii) Work done by impeller per second and (iii) Manometric efficiency.

Or

16. (a) Explain the characteristics curve of a centrifugal pump.
(b) With a neat sketch, explain the principle and working of a multistage centrifugal pump.
(6 + 6 = 12 marks)
17. The pressure difference Δp in a pipe of diameter D and length L due to viscous flow depends on the velocity V , viscosity μ , and density ρ . using Buckingham's π -theorem, obtain an expression for Δp .

Or

18. Derive the expression for (Turbine) (i) Unit speed, (ii) Unit discharge, and (iii) Unit power.
19. The cylinder bore diameter of a single acting reciprocating pump is 150 mm . and its stroke is 300 mm . The pump runs at 50 r.p.m. 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 liters/s , find the percentage slip. Also determine the acceleration head at the beginning and middle of the delivery stroke.

Or

20. (a) With a neat sketch, explain the principle and working of a self priming pump.
(b) With a neat sketch, explain the principle and working of a fluid coupling.

(6 + 6 = 12 marks)

[5 × 12 = 60 marks]

