C 15640 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2011

ME 09 405—FLUID MACHINERY

(2009 admissions)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What do you mean by impact of Jet ? Explain.
2. Define the terms Dimensional analysis and Model analysis.
3. What is the difference between impuls turbine and reaction turbine ?
4. What is meant by specific speed for pump ?
5. What is a Surge tank ? What are its uses in a hydraulic turbine installation ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Derive an expresion for force exerted by the jet on a stationary Vertical plate.
2. Explain Buckingham's π-theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis ?
3. Explain the effect of blade angle on pump head.
4. What is a positive displacement pumps ? How does it differ from a turbo pump in its basic principle of operation ?
5. What is necessity of governing a hyraulic turbine ? Explain how the Pelton wheel turbine can be governed.
6. Explain the construction and working of a jet pump with a neat sketch.

(4 × 5 = 20 marks)

Part C

Answer any **four** *questions.*
Each question carries 10 *marks.*

1. A nozzle of size 10 cm. diameter issues a jet of water with a velocity of 50 m/s. The jet strikes a moving at plate perpendicularly at the centre. The plate is moving with a velocity of 15 m/s in the direction of the jet. Calculate :

Turn over

(i) The force exerted on the plate.

(ii) The work done.

(iii) Efficient of the jet.

Or

2. The power P developed by a water turbine depends on the rotational speed N, operating head H, gravity *g*, diameter D and breadth B of the runner, density ρ and viscosity μ of the water. Show by dimensional analysis that

$$P = \rho D^5 N^3 \varphi \left(\frac{H}{D}, \frac{D}{B}, \frac{\rho D^2 N}{\mu}, \frac{ND}{\sqrt{gH}} \right).$$

3. Explain the construction and working of a Pelton wheel turbine. With the help of a neat sketch.

Or

4. An inward flow reaction turbine of inter diameter 1.2 m. operates under a head of 150 m. and requires a discharge of 6 $m.^3/s$ at a rotational speed of 400 r.p.m. The guide vane angle is 20° and the water leaves the runner blade axially. If the runner is 0.1 m. wide at the inlet, calculate :

(i) The torque and power supplied to the shaft ; and

(ii) The efficiency of the turbine.

5. Derive the equation for work done by the impeller of a centrifugal pump on the fluid handled. What are different efficiencies of centrifugal pump ?

Or

6. Find the rise in pressure in the impeller of a centrifugal pump through which water is flowing at the rate of 15 lit/s. The internal and external diameters of the impeller are 20 cm. and 40 cm. respectively. The widths of impeller at inlet and outlet are 1.6 cm. and 0.8 cm. The pump is running at 1200 r.p.m. The water enters the impeller radilly at inlet and impeller vane angle at outlet is 30°. Neglect losses through the impeller.

7. A single-acting reciprocating pump running at 30 r.p.m., delivers 0.012 $m.^3/s$ of water. The diameter of the piston is 25 cm. and stroke length 50 cm. Determine :

(i) The theoretical discharge of the pump.

(ii) Coefficient of discharge.

(iii) Slip and percentage slip of the pump.

Or

8. Explain the construction and working of a gear pump with a neat sketch, and also explain its performance curve.

(4 × 10 = 40 marks)