

FACULTY OF ENGINEERING**B.E. 3/4 (Mech.) I – Semester (Supplementary) Examination, July 2014****Subject: Hydraulic Machinery and Systems****Time: 3 Hours****Max.Marks: 75**

Note: Answer all questions from Part - A. Answer any five questions from Part - B.
PART – A (25 Marks)

- 1 A jet of water of 8 cm diameter impinges normally on a fixed plate with velocity of 25 cm/s. The force exerted on the plate is a) 3141.59 N b) 3241.69 N c) 3142.59 N d) 3161.8 N. 3
- 2 The force exerted by a jet of water on a stationary curved plate in the direction of jet is equal to
a) $9aV^2$ b) $9aV^2 \sin^2\theta$ c) $9aV^2 (1+\cos\theta)$ d) None of the above 3
- 3 In a reciprocating pump, air vessels are used to
a) Reduce the flow b) Increase the delivery head
c) Smoothen the flow d) Reduce the acceleration head 3
- 4 During suction stroke of a reciprocating pump, the separation may take place
a) In the beginning of the suction stroke b) In the middle of the suction stroke
c) In the end of the suction stroke d) None of the above 2
- 5 Discharge Q of a centrifugal pump is given by
a) $Q = \pi DV_f$ b) $Q = \pi bV_f$
c) $Q = \pi DbV_f$ d) $Q = DbV_f$ 2
- 6 If pump NPSH requirements are not satisfied
a) It will consume excessive power b) It will not develop head
c) It will cavitate d) Efficiency will be low 3
- 7 The over all efficiency of a Pelton wheel is 70%. If the mechanical efficiency is 85%, the hydraulic efficiency will be
a) 62.5% b) 72.3% c) 82.4% d) 87.4% 3
- 8 Governing of turbine means
a) The discharge is kept constant under all conditions
b) The speed is kept constant under all conditions
c) Allow the turbine to run at run away speed
d) The power developed is kept constant under all conditions 3
- 9 In a hydraulic coupling, the torque transmitted is 50 KNM, when the speed of the driving and driven shaft is 900 rpm and 720 rpm respectively the slip of the coupling will be
a) 20% b) 25% c) 80% d) 90% 2
- 10 Identify an axial flow turbine from the following:
a) Pelton wheel b) Kaplan turbine
c) Francis turbine d) Both a and b. 1

PART – B (50 Marks)

- 11 A 20 cm diameter jet of water having a velocity of 12 m/s strikes a stationary flat plate at an angle of 30° to the normal. Calculate the force exerted by the jet on the plate
 - a) In the direction normal to the plate and
 - b) In the direction of Jet.
- 12 A double acting reciprocating pump, running at 45 rpm, is discharging $0.009 \text{ m}^3/\text{s}$ of water. The pump has a stroke of 40 cm. The diameter of the piston is 20 cm. The suction and delivery heads are 3 m and 14 m, respectively. Find the slip of the pump and power required to drive the pump. Neglect the effect of piston rod area.
- 13 Explain the construction and working principle of a single-acting reciprocating pump with the help of a neat sketch.
- 14 A centrifugal pump delivers $0.3 \text{ m}^3/\text{s}$ against a head of 30 m at 1400 rpm. The external diameter of impeller is 0.5 M and the outlet width is 0.05 M. If the manometric efficiency is 80%, find the vane angle at outlet.
- 15 A turbine operating under a head of 30 m develops 10000 KW at a speed of 120 rpm. Determine the speed and power developed by the turbine when the head on the turbine is reduced to 20 M.
- 16 Differentiate between an impulse turbine and a reaction turbine.
- 17 Explain the working principles of hydraulic lift and hydraulic crane with neat sketches.
