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FACULTY OF ENGINEERING & TECHNOLOGY

B.E.(Mechanical) Examination - DEC - 2014

Turbo Machines (Revised)

[Time: THREE Hours] **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

N.B
1) Answer three questions from each section
2) Use of steam tables Mollier charts, non- programmable calculator is allowed
3) Assume suitable data, if necessary.

SECTION A

Q.1	A	Define turbo-machines and explain briefly the major parts of turbo-machines	06
	B	Explain how the principle of dimensional analysis is applied to the turbo-machines and explain their significance	07
Q.2	A	Prove that the force exerted by a jet of water on a fixed semi- circular plate in the direction of the jet when the jet strikes at the centre of the semicircular plate is two times the force exerted by the jet on fixed vertical plate	07
	B	A jet of water having a velocity of 15m/s, strikes a curved vane which is moving with a velocity of 6m/s in the same direction as that of the jet at inlet. The vane is so shaped that the jet is deflected through 135^0. Diameter of jet is 100mm. assuming the vane to be smooth. Find i) Force exerted by the jet on the vane in the direction of motion ii) Power exerted on the vane and iii) Efficiency of the vane	06
Q.3	A	Differentiate between i) radial and axial flow turbine ii) the impulse and reaction turbine	06
	B	Describe briefly the function of various main components of Pelton turbine with neat sketches	07
Q.4		A Kaplan turbine has outer and hub diameters of 0.4m and 2.0m respectively. It develops 25MW when working under a head of 20m with overall efficiency of 87% and running at 150 rpm. Find i) The discharge through the turbine ii) The peripheral velocity at the hub and at the tip of the blade, and iii) The runner blade angle at inlet and outlet.	13
Q.5		Write short notes on any three of following i) Draft tube and its functions ii) Specific speed and its significance in study of hydraulic turbines iii) Classifications of hydraulic turbine iv) Francis turbine	13

SECTION B

Q.6	A	Explain the following terms as applied to the centrifugal pump i) Static suction lift ii) Static discharge head and iii) Total head	06
	B	A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1200rpm works against a total head of 75m. The velocity of flow through the impeller is constant and equal to 3 m/s. the vanes are set back at an angle of 30^0 at outlet. If the outer diameter of the impeller is 600mm and width at outlet is 50mm, determine: a) Vane angle at inlet, b) Work done per second by impeller, c) Manometric efficiency	07
Q.7		The blade speed of a single ring of impulse turbine is 300m.s and the nozzle angle is 20^0. The isentropic heat drop is 475 KJ/kg and the nozzle efficiency is 0.85, Given that the blade velocity coefficient is 0.7 and the blades are symmetrical, draw the vector diagrams and calculate for a mass flow of 1 kg/s: a) Axial thrust on the blading b) Blade efficiency and maximum blade efficiency c)Heat equivalent of the friction of the blading	13
Q.8	A	Draw a schematic diagram of a gas turbine plant and explain its working. Represent cycle on p – v and T – s diagram and mention the assumptions made	06
	B	A gas turbine plant with heat exchanger operates between 10^0C and 700^0C with the pressure ratio 5. Assuming isentropic efficiencies of compressor and turbine 100% and also the effectiveness of heat exchanger is also 100%. Find the specific work output and thermal efficiency of the plant	07
Q.9	A	Why is compounding of steam turbine necessary? Describe with neat sketch the compounding of steam turbine	06
	B	What do you mean by pump characteristics? Explain briefly the uses of such characteristics	07
Q.10		Write short notes on any three of following i) Stirling cycle ii) Nozzles and diffusers iii) Priming of centrifugal pump iv) Brayton cycle	13