Date 01/05/2018   Weightage: 30%(60 marks)

Note: Use separate answer book for each section. Attempt all questions in sequence. Underline final answers. State clearly any assumption you make.

SECTION: A

Q1 a) What happens when a bird hits the engine of a commercial aeroplane? Discuss with reference to its compressor.   [6]

Q1 b) Discuss various curvatures of blades of a centrifugal pump along with the velocity triangles. Also discuss with proper justifications their effects on head, if discharge is varied at constant speed. Which is the most efficient design among the three and why?   [6]

Q2 A single cylinder, single acting square reciprocating pump has piston diameter and stroke length of 300 mm. The level of water in the sump is 5 m below the center-line of the pump and water being delivered at a height of 22 m above the pump center-line. The suction and delivery pipes are 8m and 28m long respectively, and diameter of both pipes is 150 mm. If the pump is running at 30 rpm and the coefficient of friction for pipe is 0.005, estimate the power required to drive the pump.   [9]

Q3 The mean diameter of the rotor of an axial flow compressor is 0.5 m and it rotates at 15000 rpm. The flow velocity is 220 m/s and is constant. The velocity of whirl at inlet is 80 m/s. The inlet pressure and temperature are 1 bar and 300 K. The stage efficiency is 0.88. The pressure ratio through the stage is 1.5. Draw the velocity triangle and calculate the (i) blade angles, (ii) power input, and (iii) degree of reaction.   [9]

SECTION: B

Q.4 The centrifugal compressor has to be operated in its operating range. Discuss about this range with its upper limit and lower limit and related limitations.   [4]

Q5 Discuss various methods of reducing speed in impulse steam turbines with neat sketch.   [6]

Q5 b) What do you mean by Unit quantities and Specific quantities? Discuss their significance and usage.   [4]

Q6 A reaction turbine having rotor diameter as 1400mm is rotating at 3000 rpm. The stage is designed in such a fashion that the enthalpy drop in both, rotor and stator, is same. If the speed ratio is 0.7 and blade angle at outlet is 20°, draw the velocity triangles and determine the blade angle at inlet and diagram efficiency.

The turbine has to be redesigned for the maximum diagram efficiency, under which condition you will get the maximum diagram efficiency keeping the same blade angles and what will be the value of the diagram efficiency?   [10]

Q7 Explain various types of nozzles available with suitable sketch. Which type of nozzle is used in impulse steam turbines?   [6]

***** BEST LUCK *****