

## FACULTY OF ENGINEERING

B.E. 3/4 (Prod.) II-Semester (Supplementary) Examination, December 2010

## TURBO MACHINERY

Time : Three Hours]

[Maximum Marks : 75

*Answer ALL questions from Part A. Answer any FIVE questions from Part B.*

## PART—A (Marks : 25)

1. Write the losses in turbomachines. 2
2. Explain briefly cavitation. 3
3. Minimum starting speed of centrifugal pump. 3
4. Explain the term Degree of Reaction. 2
5. Explain Rankine Cycle. 2
6. Explain Pressure compounding of steam turbines. 3
7. Define Isentropic efficiency of nozzle. 2
8. Explain Delavel steam turbine. 2
9. Write the assumptions made in the derivation of Bernouli's equation. 3
10. What is the difference between Reheating and Regeneration ? 3

## PART—B (Marks : 50)

11. Derive the equation of motion for an ideal flow (Euler's equation). 10
12. The mean bucket speed of Pelton turbine is 15 m/s. The rate of flow of water supplied by the jet under a head of 4.2 m is  $1 \text{ m}^3/\text{s}$ . If the jet is deflected by the buckets at an angle  $165^\circ$ , find the power and efficiency of the turbine (take  $C_v = 0.985$ ). 10
13. Air at a temperature of  $27^\circ\text{C}$  flows into a centrifugal compressor running at 20,000 rpm. The following data are given :
 

Slip factor	—	0.80
Power input factor	—	1
Isentropic efficiency	—	80%
Outer dia of blade tip	—	0.5 m

 Assuming the absolute velocity of air entering and leaving the compressor are same, find :
  - (a) Static temperature rise of air passing through compressor
  - (b) The static pressure ratio. 10

14. (a) Explain the terms “over expanding” and “under expanding” as applied to a fluid flow through nozzle. 5
- (b) Is the thermal efficiency of a Rankine cycle equal to that of Carnot cycle operating between same temperature limits ? If it is different explain the reasons for the same. 5
15. (a) What do you understand by closed cycle and open cycle gas turbine plants ? 3
- (b) Explain with neat sketch working of gas turbine plant with intercooling, regeneration and reheating. 7
16. (a) Compare Impulse turbine and Reaction turbine. 6
- (b) Draw the Inlet and Outlet velocity diagrams for backward curved blade, radial blade and forward curved blade. 4
17. Steam at initial pressure of 7 bar and in dry saturated condition flows through convergent-divergent nozzle having throat area  $3.5 \text{ cm}^2$ . The pressure at exit plane is 1.4 bar and exit velocity is 800 m/s. The flow from nozzle entrance to throat is reversible and adiabatic. Determine exit area of nozzle and overall nozzle efficiency. 10