MAHATMA GANDHI UNIVERSITY
MODEL QUESTION PAPER
SEVENTH SEMESTER MECHANICAL ENGINEERING
ME010 706L02-TURBO MACHINES

PART-A: Each Question carries three marks (3*5=15)

1. State Buckingham's π-theorem
2. Explain the phenomenon of surging in a centrifugal compressor
3. Define slip factor? How can it be reduced?
4. Explain the concept of radial equilibrium in an axial flow compressor
5. What do you mean by compounding of a steam turbine?

PART-B: Each Question carries FIVE marks (5*5=25)

6. Derive an expression for Utilization factor of turbines
7. A turbine has the following data. Water is directed at an angle of 30 deg to the tangent. Degree of reaction is 0.45, utilization factor is 0.895.The absolute velocity at exit is axial, water enters the rotor with a static pressure 500 kPa and stagnation pressure of 750 kPa. Calculate the inlet blade angle and the work output for a mass flow rate of 10 kg/s
8. Explain the process of cavitation. How can it be avoided?
9. Draw the combined velocity triangle for an axial flow compressor for which the value of degree of reaction is 50%
10. List out the advantages and disadvantages of velocity compounding

PART-C: Each Question carries TWELVE marks

11. Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a property. Assume that the thrust P depends upon the angular velocity ω speed of advance V, diameter D, dynamic viscosity μ mass density ρ elasticity of the fluid medium which can be denoted by speed of sound C in the medium

OR

12. Derive Euler turbine equation and explain the three components involved

13. Briefly explain the characteristic curves of centrifugal fans and blowers

OR

14. Explain the various losses occurring during the operation of centrifugal fans and blowers

15. Explain the working principle of a centrifugal compressor. Also draw the enthalpy-entropy diagram for the same

OR

16. A centrifugal compressor runs at a speed of 15000 rpm and delivers 30 kg of air per second. Exit radius is 0.35m, relative velocity at exit is 100 m/s at an exit angle of 75°. Assume axial inlet and T_{01}=300 K and p_{01}= 1 bar. Calculate (a) the torque (b) the power required to drive the compressor (c) the ideal head developed (d) the work done and (e) the exit total pressure

17. Derive an expression for Degree of Reaction for an axial flow compressor

OR

18. Draw the temperature-entropy diagram for a stage of an axial flow compressor. Show that the stagnation enthalpy remains the same in the relative system

19. List out the various performance parameters of an impulse turbine. Derive the expressions for (a) blading efficiency (b) nozzle efficiency and (c) stage efficiency

OR

20. Briefly explain the need for compounding of a steam turbine. What are the three methods of compounding of steam turbines?