

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2019

Subject Code: 2150102

Date: 20/06/2019

Subject Name: Fundamentals of Turbo Machines

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

MARKS

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|------------|---|-----------|
| Q.1 | (a) Explain the need of prime movers in gas turbine engines. | 03 |
| | (b) Explain the need of compressor in gas turbine engines. | 04 |
| | (c) Draw the complete h-s diagram for Axial compressor stage. | 07 |
| Q.2 | (a) Classify turbomachines. | 03 |
| | (b) Define degree of reaction. Draw h-s diagram for 50% reaction axial turbine stage. | 04 |
| | (c) Draw velocity triangle for an axial turbine stage. | 07 |
| | OR | |
| | (c) Derive expressions for spouting velocity and stage efficiencies for radial turbine. | 07 |
| Q.3 | (a) Differentiate axial machines and radial machines. | 03 |
| | (b) Write a shortnote on workdone factor in compressor stage. | 04 |
| | (c) Draw and explain the velocity triangle for stage of axial compressor. Also derive the expression of degree of reaction and work consumed by the compressor. | 07 |
| | OR | |
| Q.3 | (a) Compare axial compressor and centrifugal compressor for their suitability to use in jet engines. | 03 |
| | (b) How to find equilibrium running point for a turbomachine? | 04 |
| | (c) Write a note on radial equilibrium and free vortex stage. | 07 |
| Q.4 | (a) Why centrifugal compressors have volute diffuser? | 03 |
| | (b) Define flow coefficient, work loading coefficient and utilization factor. | 04 |
| | (c) Draw velocity triangles for forward, backward and radial tipped centrifugal compressor. | 07 |
| | OR | |
| Q.4 | (a) What is rotating stall? When does it occur? | 03 |
| | (b) Explain in the brief losses occur in turbomachines. | 04 |
| | (c) Draw impellers for centrifugal compressor stage. | 07 |
| Q.5 | (a) Draw change in pressure and velocity along the fixed blades and rotor blades for two stage reaction turbine. | 03 |
| | (b) Draw and explain schematic diagram for a radial turbine stage. | 04 |
| | (c) Draw the velocity triangle of outward flow reaction turbine. | 07 |
| | OR | |
| Q.5 | (a) What is equilibrium running point and equilibrium running line? | 03 |
| | (b) Write a note on workdone factor. | 04 |
| | (c) With a neat sketch explain the velocity and pressure compounded axial turbine stages. | 07 |
