

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2024****Subject Code:3171927****Date:19-11-2024****Subject Name: Turbo Machines****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Define turbomachines. Classify different types of turbomachines. **03**  
 (b) Differentiate between following terms – Compressor, Blower and Fan. **04**  
 (c) explain principal parts of a turbine with neat sketch of the cross-sectional view of turbine. **07**

- Q.2** (a) Which types of turbomachines are not suitable for large power plant applications? Why? **03**  
 (b) Define total to total efficiency and total to static efficiency for axial flow turbines. **04**  
 (c) Explain multi-stage velocity compounded impulse turbine with neat sketch. **07**

**OR**

- (c) Draw and explain velocity triangle for inward flow radial (IFR) turbine. Also show that for 90° IFR turbine, stage loading coefficient is unity. **07**

- Q.3** (a) Draw a Mollier chart expression in the 90° IFR turbine. **03**  
 (b) Axial flow compressors are ideal for constant load applications. Why? **04**  
 (c) Draw a neat sketch of an axial flow compressor with inlet guide vanes and explain the working of the compressor. **07**

**OR**

- Q.3** (a) Define degree of reaction for radial flow turbines. **03**  
 (b) List out various advantages and disadvantages of an axial flow compressors. **04**  
 (c) Draw velocity triangle at the entry and exit for the axial compressor stage and define compressor stage efficiency. **07**

- Q.4** (a) Draw the sketch of a centrifugal compressor stage indicating the principal parts. **03**  
 (b) What is the function of diffuser in centrifugal compressor? **04**  
 (c) A centrifugal compressor raises the static pressure of air by 14cm of water, while running at a speed of 650 RPM and consuming 85 metric HP as power. The static pressure and temperature of the air at the fan intake are 75 cm of Hg and 25°C, respectively, while the mass flow rate of air is 260 kg/min. Find the exit static pressure and the volume flow rate in m<sup>3</sup>/min. (Take 1 metric HP = 0.735 KW) **07**

**OR**

- Q.4** (a) What is no-slip condition in centrifugal compressor? Define slip factor. **03**  
 (b) Write a note on construction and working of centrifugal compressor. **04**  
 (c) Define fluid slip. How can the fluid slip be reduced in centrifugal compressor **07**

- Q.5** (a) List out various methods to reduce Surging in axial fans. **03**  
 (b) Draw a sketch of an axial flow ducted fan without guide vanes and highlight various parts of it. **04**  
 (c) List out advantages and disadvantages of CFD. Explain limitations for turbomachines point of view. **07**

**OR**

- Q.5** (a) Explain briefly – noise in fans. **03**  
 (b) Explain losses in centrifugal fan. **04**  
 (c) Explain application of CFD in analyzing turbomachine design. **07**

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