

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VIII (OLD) EXAMINATION – SUMMER 2019****Subject Code: 181904****Date: 20/05/2019****Subject Name: Thermal Engineering****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.

- Q.1** (a) Define nozzle and describe effects of friction on performance of the steam nozzle with h-s diagram. **07**  
(b) What is necessity of steam compounding in impulse turbine? Explain velocity compounding with neat sketch. **07**
- Q.2** (a) Give detailed classification of steam turbine. **07**  
(b) The total tangential force on one stage of Parson's turbine is 1100 N. When the blade speed is 100 m/s, the mass flow rate is 5.5 kg/sec. The blade outlet angle is  $20^\circ$ . Determine the steam velocity at outlet from the blades. **07**
- OR**
- (b) Explain nozzle control governing of steam turbine with figure. **07**
- Q.3** (a) Give classification of gas turbine and explain working of closed cycle gas turbine with figure. **07**  
(b) Write a short note on combined gas and steam power plant. **07**
- OR**
- Q.3** (a) Explain different methods to improve thermal efficiency of a gas turbine plant. **07**  
(b) A gas turbine operates on Brayton cycle. The temperature range is 1050 K and 288 K. Find pressure ratio for maximum power output. Also determine thermal efficiency, work ratio and power output, if the mass flow rate of air is 20 kg/sec. Take  $C_p = 1.005$  kJ/kg K and  $\gamma = 1.4$  for compression and expansion process. **07**
- OR**
- Q.4** (a) Give difference between jet engine and rocket engine. **07**  
(b) Explain working principle of Plain Labyrinth gland. **07**
- OR**
- Q.4** (a) Explain working of Pulse jet engine with figure and give its merits. **07**  
(b) Write short note on binary vapour cycle. **07**
- Q.5** (a) Derive equation for maximum mass flow rate of steam through nozzle. **07**  
(b) Explain annular combustion chamber of gas turbine. **07**
- OR**
- Q.5** (a) Derive equation of Degree of Reaction for reaction turbine. **07**  
(b) Derive equation of general relationship between area, velocity and pressure in nozzle flow. **07**

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