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Total No. of Questions : 09

B.Tech.(Marine Engineering) (2013 Onwards) (Sem.-4)

APPLIED THERMODYNAMICS – II

Subject Code : BTME-404

M.Code : 72437

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

- 1. Write briefly :**
- a) Define Volumetric Efficiency of a compressor.
 - b) What is surging in centrifugal compressor?
 - c) Define Term Slip Factor and power input factor.
 - d) Define propulsive power and propulsive efficiency.
 - e) State the assumptions made in practical cycle analysis in gas turbine.
 - f) Enumerate the applications of compressed air.
 - g) What is meant by perfect cooling?
 - h) How gas turbines are classified?
 - i) What is the principle of jet propulsion?
 - j) What is a turbojet engine?

SECTION-B

2. Differentiate between a closed cycle gas turbine and an open cycle gas turbine.
3. Describe the principle of working of a turboprop engine.
4. A centrifugal compressor with 70 % isentropic efficiency delivers 20 kg of air per minute at a pressure of 3 bar. If the compressor receives air at 20° C and at a pressure of 1 bar, find the actual temperature of the air at exit. Also find the power required to run the compressor, if its mechanical efficiency is 95 %. Take γ and c_p for air as 1.4 and 1 kJ/kg K respectively.
5. Free air of 50 m³/min is compressed from 101.3 kPa to 2.23 bar in roots blower. Determine the power required and isentropic efficiency.
6. Explain the working principle of centrifugal compressor with the help of h-s chart.

SECTION-C

7. In a gas turbine plant, working on Brayton cycle with regenerator of 75% effectiveness, the air at the inlet to the compressor is at 1 bar and 303 K. The pressure ratio is 6 and maximum temperature is 900° C. If the turbine and compressor, each has an efficiency of 80%, find the percentage increase in cycle efficiency due to regeneration.
8. An axial flow compressor of 50 % reaction design has blades with inlet and outlet angles of 44° and 13° respectively. The compressor is to produce a pressure ratio of 5:1 with isentropic efficiency of 87% when the inlet temperature is 290 K. The mean blade speed and axial velocity are constant throughout the compressor. Assuming the blade velocity is 180 m/s and work input factor is 0.85, find the number of stages required.
9. A rotary compressor working between 1 bar and 2.5 bar has internal and external diameters of impeller as 300 mm and 600 mm respectively. The vane angle at inlet and outlet are 30° and 45° respectively. If the air enters the impeller at 15 m/s, find:
 - a) Speed of the impeller in r.p.m.
 - b) Work done by the compressor per kg of air.

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.