Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.–4)

APPLIED THERMODYNAMICS–II

Subject Code : BTME-404

M.Code : 59132

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. Answer briefly :

a) Write the different applications of compressed air.

b) List the advantages of multistage compression.

c) Define 'degree of reaction' in relation to axial flow compressor.

d) What is surging?

e) Write the merits and demerits of axial flow compressor.

f) Mention the application of gas turbine.

g) Name the various modes of energy transfer in impeller.

h) List the requirements of a gas turbine combustion chamber.

i) Define 'angle of attack'.

j) Write name of different fuels used in the gas turbine. $10 \times 2 = 20$

SECTION-B

2. Explain with a neat sketch the working of a single stage reciprocating compressor. 5

3. Distinguish between positive and non-positive displacement type compressors. 5

4. Comment on the validity of the statement : '*The thermodynamic efficiency of a centrifugal compressor is referred to adiabatic condition where as that of reciprocating compressor is referred to isothermal condition*'. 5

5. A jet propulsion system has to create a thrust of 90 tonnes to move the system at a velocity of 650 km/hr. Find the exit gas velocity and propulsion efficiency if the gas flow rate through the system is restricted to 25 kg/s.

6. State the difference between the jet propulsion and rocket propulsion system. 5

SECTION-C

7. Set up the following expression for volumetric efficiency with respect to free air delivery,

$$\eta_{vol} = \frac{p_1 T_0}{p_0 T_1}\left[1 + C - C\left(\frac{p_2}{p_1}\right)^{1/n}\right]$$

Where the symbols in the expression have their usual meanings. 10

8. A two-cylinder double acting reciprocating compressor sucks in air at pressure 0.98 bar and temperature 300 K. The delivery of the compressed air to the receiver is at 6 bar. The breathing capacity of the compressor is stated to be 2.5 m^3/min when measured at 1 bar and 228 K. The mean speed of the compressor is limited to 120 mm/minute and the stroke is 0.75 times the cylinder diameter. If the law of compression is $pV^{1.3}$, make calculation for (a) Cylinder diameter and stroke length (b) Compressor speed in rev/min (c) Shaft power if the mechanical efficiency is 85% (d) isothermal efficiency.

Neglect the effect of clearance and piston rod diameter. 10

9. Sketch Brayton cycle on *p-v* and *T-s* plots and derive a relation for its thermal efficiency in terms of pressure ratio. 10

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.