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Code No: 155SD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, August - 2022
THERMAL ENGINEERING – I
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1. In an air standard diesel cycle, the compression ratio is 16, and at the beginning of isentropic compression, the temperature is 15^0C and the pressure is 0.1 M Pa. Heat is added until the temperature at the end of the constant pressure process is1480^0C. Calculate
   a) The cut-off ratio,
   b) The heat supplied per kg of air,
   c) The cycle efficiency and
   d) The m.e.p. [15]

2.a) Mention the various fuel injection systems are there for diesel engines. Explain briefly.
   b) Explain the various mechanism of lubrication and their functions. [8+7]

3.a) Briefly explain the stages of combustion in SI engine elaborating the flame front propagation.
   b) Explain with figures the various types of combustion chambers used in SI engines. [8+7]

4.a) What are the various types of combustion chambers used in CI engines? Explain them briefly.
   b) What is delay period and what are the factors that affect it? [7+8]

5. An engine working on the Otto cycle has an air standard cycle efficiency of 56% and rejects 544 kJ/kg of air. The pressure and temperature of air at the beginning of compression are 0.1 MPa and 60^0C respectively. Compute (a) the compression ratio of the engine (b) the work done per kg of air, (c) the pressure and temperature at the end of compression, and (d) maximum pressure in the cycle. [15]

6.a) State the main parts of reciprocating air compressor.
   b) What is clearance ratio? Write the effect of clearance volume on performance of a reciprocating compressor. [5+10]

7. An axial flow compressor having eight stages and with 50% reaction compresses air in the pressure ratio of 4:1. The air enters the compressor at 20^0C and flows through it with a constant speed of 90 m/s. The rotating blades of compressor rotate with a mean speed of 180 m/s. isentropic efficiency of the compressor may be taken as 82%.
   Calculate: a) Work done by the machine, b) Blades angles. [15]

8.a) Derive the thermal efficiency of an ideal gas turbine power plant.
   b) A gas turbine plant receives air at 1 bar and 290 K and compresses it to 5 bar. If the temperature of air after compression is 1000 K. Find the thermal efficiency of the turbine. Take γ=1.4 for air. [7+8]

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