Reg. No. | | | | | | | | | | | | |

Question Paper Code : 51530

B.E/B. Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electronics and Instrumentation Engineering

EI 2254/EI 46/ME 1260/080300011/10133 EI 406 – APPLIED THERMODYNAMICS

(Common to Instrumentation and Control Engineering)

(Regulations 2008/2010)

Time : Three Hours **Maximum : 100 Marks**

(Use of steam tables, refrigeration tables, psychrometric charts and heat and mass transfer tables are permitted)

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are the different types of thermodynamic system ?

2. Define path function.

3. List the application of internal combustion engines.

4. What is ignition ?

5. Classify the types of boiler.

6. What are the merits of reaction turbine ?

7. Why the inter-cooler is need in compressor ?

8. Define psychrometric process.

9. State critical thickness.

10. Define Radiation Shape Factor.

PART – B (5 × 16 = 80 Marks)

11. (a) Neatly discuss about the application of steady flow energy equation to engineering systems. **(16)**

OR

(b) A vessel of 2.5 m^3 capacity contains one kg-mole of nitrogen at, 100°C. Evaluate the specific volume and pressure. If the gas is cooled to 30°C, calculate the final pressure, change in specific internal energy and specific enthalpy. **(16)**

12. (a) In an air standard Otto cycle, the compression ratio is 7 and the compression begins at 1 bar and 313K. The heat added is 2510 kJ/kg. Find : (1) Maximum temperature and pressure of the cycle, (2) Work done per kg of air, (3) Cycle efficiency, and (4) mean effective pressure. Take for air, c_v = 0.713 kJ/kg-K and R = 287 J/kg-K. **(16)**

OR

(b) Illustrate the working principle and the advantage of four stroke SI and CI engines with neat sketches. **(16)**

13. (a) With a neat sketch explain steam power plant and their accessories. **(16)**

OR

(b) The blade speed of a ring impulse blading is 250 m/s and nozzle angle is 20°. The heat drop is 550 kJ/kg and nozzle efficiency is 0.85. The blade discharge angle is 30° and the machine develops 30 kW, when consuming 360 kg of steam per hour. Draw the velocity diagram and calculate : (1) axial thrust on the blading, and (2) the heat equivalent per kg of steam friction of the blading. **(16)**

14. (a) A two stage, single acting air compressor compress air to 20 bar. The air enters the L.P. cylinder at 1 bar and 27°C and leaves it at 4.7 bars. The air enters the H.P. cylinder at 4.5 bar and 27°C. The size of L.P. cylinder is 400 mm diameter and 500 mm stroke. The clearance volume in both cylinders is 4% of the respective stroke volume. The compressor runs at 200 r.p.m. Taking index of compression and expansion in the two cylinders as 1.3, estimate : (i) The indicated power required to run the compressor, and (ii) The heat rejected in the intercooler per minute. **(16)**

OR

(b) Describe with neat diagram about vapour compression cycle of refrigeration. List their application. **(16)**

15. (a) Discuss Chip cooling and Thermoelectric cooling. **(16)**

OR

(b) Derive an equation for heat conduction through cylindrical wall. **(16)**