Code No: 54015

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, November/December - 2015
APPLIED THERMODYNAMICS-I
(Common to ME, AME)

Time: 3 hours
Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a) What are different losses occurring during gas exchange process in the combustion chamber of I C Engine? Explain.
  b) Compare the actual cycle with fuel air cycle for S I Engine and also for the C I Engine and discuss the salient features. [7+8]

2.a) How to achieve the load balancing in petrol engine in order to maintain the fuel feed rate depends on the loading? Explain.
  b) Why ignition is required in S I Engine? Discuss different types of ignition systems used. [7+8]

3.a) What is the influence of flame speed on the combustion performance and discuss the effect of operating variables on the flame speed.
  b) How to estimate the fuel rating for the petrol engine? Discuss different chemicals added into the petrol. [8+7]

4.a) What are different types of nozzles used in C I Engine? Discuss them in detail along with their importance.
  b) What is the need of air movement in the combustion chamber of C I Engine? Discuss the methods to create the air movement in the chamber. [8+7]

5.a) What is the use of heat balance sheet of an engine? Mention the various items to be determined to complete the heat balance sheet.
  b) A four cylinder, two stroke cycle petrol engine develops 30 kW brake power at 2300 rpm. The mean effective pressure on each piston is 6.458 bar and the mechanical efficiency is 82%. Calculate the diameter and stroke of each cylinder if the stroke to bore ratio is 1.25. Also calculate the brake specific fuel consumption of the engine, if brake thermal efficiency is 26 %. The calorific value of the fuel is 41200 kJ/kg. [7+8]

6.a) What do you mean by the perfect inter cooling? What is the amount of heat rejected in the inter cooler?
  b) A two stage air compressor receives 0.238 m^3/s of air at 1 bar and 27^{0}C and discharges it at 10 bar. The polytropic index of compression is 1.25. Determine (i) the minimum power required for the compression (ii) the power needed for single stage compression to the same pressure, (iii) the maximum temperature, (iv) the heat removed from the inter cooler. [7+8]

7.a) What are the required components for Vane type compressor? Explain them.

b) A single sided centrifugal compressor is to deliver 14 kg/s of air when operating at a stagnation pressure ratio of 4:1 and a speed of 200 rps. The inlet stagnation conditions may be taken as 288 K and 1.0 bar. By assuming the slip factor of 0.9 and as a power input factor of 1.04 and an overall isentropic efficiency of 0.8, then estimate the overall diameter of the impeller. [7+8]

8.a) What is meant by low degree of reaction and high degree of reaction? How you differentiate these two?

b) How to evaluate the energy transfer per stage of multistage axial flow compressor? [8+7]

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