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Code No: R22033 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations, April/May - 2019
THERMAL ENGINEERING - I
(Com. to ME, AME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) From the point of view of fuel-air cycle analysis, how does fuel-air ratio affect efficiency, maximum power, temperature and pressure in a cycle? (8M)
   b) What is the difference between air-standard cycle and fuel-air cycle analysis? Explain the significance of the fuel-air cycle. (7M)

2. a) Explain the principle of carburetion. Explain why a simple carburetor cannot meet the various engine requirements. (8M)
   b) With a neat sketch explain the magneto ignition system. (7M)

3. a) Bring out clearly the process of combustion in SI engines and also explain the various stages of combustion. (8M)
   b) What are different air-fuel mixtures on which an engine can be operated? (7M)

4. a) How are SI and CI engine fuels rated? (8M)
   b) Explain why a rich mixture is required for the following: (7M)
   (i) idling, (ii) maximum power, and sudden acceleration.

5. a) Explain the basic principle and working of hydraulic dynamo-meter. (8M)
   b) Explain the method of motoring test for obtaining friction power of an engine. (7M)

6. a) Classify air compressors. Describe the working of a single stage reciprocating air compressor. (7M)
   b) An air compressor takes in air at 0.98 bar and 20^{o}C and compresses it according to the law $pv^{1.2}$ = C. It is then delivered to a receiver at constant pressure of 9.8 bar. Determine: i) The temperature at the end of compression; ii) The work done per kg of air; iii) The heat transferred during the compression; and iv) The work done during delivery. Take R = 287 J/kg K and ɣ = 1.4. (8M)

7. a) Give the mechanical details and explain the principle of working of Vane sealed compressor. (7M)
   b) A rotary air compressor compresses 100 kg of air per minute from 1.2 bar and 20^{o}C to 4.8 bar. Find the power required by the compressor, if the compression is isentropic and by the relation $pv^{1.5}$ = C. Take specific heat, c_p = 1.008 kJ/kg K. (8M)

8. a) Derive an expression for work done in an axial compressor. What is meant by work done factor? (7M)
   b) An axial flow compressor takes in 1000m^3/min of free air at 0.9 bar and 15^{0}C. The blades are of aero-foil type having projected area and blade length as 19.25 cm^2 and 6.75 cm respectively. The blade ring mean diameter is 60cm and speed is 6000 rpm. On each blade ring there are 50 blades and the blades occupy 10% of the axial area of flow values of C_L and C_D are 0.6 and 0.05 respectively at zero angle of incidence. Assuming isentropic compression, calculate the pressure rise per blade ring and the power input per stage. Assume axial inlet. (8M)

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