Combined First and Second Semester B.Tech. Degree Examination, January 2019  
(2013 Scheme)  
13.107 : BASIC MECHANICAL ENGINEERING (ACEFRT)

Time : 3 Hours  
Max. Marks : 100

PART - A

Answer all questions. Each question carries 2 marks.

1. Define internal energy. How is energy stored in molecules and atoms?

2. For the same compression ratio and heat rejection, which cycle is most efficient: Otto, Diesel or dual? Explain with p-v and T-s diagrams.

3. What do you understand by term isothermal process?

4. Define continuity equation and Bernoulli's equation.

5. How does the change in compression ratio affect the air standard efficiency of an ideal Otto cycle?

6. What is the function of camshaft and crankshaft?

7. What are the undesirable effects of cavitation in a pumping system?

8. What are the effect of superheat and sub cooling in vapour compression cycle?

9. What is wiping? How it can be avoided in belt drive?

10. Write short note on hot working of metals.
PART – B

Answer any one full question from each Module. Each question carries 20 marks.

Module – I

11. a) An engine equipped with a cylinder having a bore of 15 cm and a stroke of 45 cm operates on an Otto cycle. If the clearance volume is 2000 cm$^3$, compute the air standard efficiency. 10

b) Give the criteria of reversibility, irreversibility and impossibility of thermo dynamic cycle. 10

OR

12. a) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air? 10

b) A pipe of diameter 400 mm carries water at a velocity of 25 m/s. The pressures at the points A and B are given as 3 bar and 2.2 bar respectively while the datum head at A and B are 28 m and 30 m. Find the loss of head between A and B. 10

Module – II

13. a) Derive an expression for air standard efficiency of a diesel cycle. 8

b) A six cylinder petrol engine has a compression ratio of 5 : 1. The clearance volume of each cylinder is 110 cc. It operates on the four stroke constant volume cycle and the indicated efficiency ratio referred to air standard efficiency is 0.56. At the speed of 2400 rpm, it consumes 10 kg of fuel per hour. The calorific value of fuel is 44000 kJ/kg. Determine the average indicated mean effective pressure. 12

OR

14. a) Explain why cooling is necessary in an I.C. engine. 10

b) What are the considerations which would guide you in selecting the type of boiler to be adopted for a specific purpose? 10

Module – III

15. a) Estimate the reduction in power consumption of condensate transfer pump by reducing speed of the pump by 20% to the rated speed. 10

b) Explain pressure-velocity compounding with a neat sketch. 10

OR
16. a) A Freon-12 refrigerator producing a cooling effect of 20 kJ/s operates on a simple vapour compression cycle with pressure limits of 1.509 bar and 9.607 bar. The vapour leaves the evaporator dry saturated and there is no under cooling. Determine the power required by the machine.

b) Discuss the various factors to be considered while selecting the site for nuclear power station. Discuss its advantages and disadvantages.

Module – IV

17. Design a V-belt drive and calculate the actual belt tension and average stress for the following data. Driven pulley diameter, D = 500 mm, driver pulley diameter, d = 150 mm, centre distance c = 925 mm, speed $n_1 = 1000$ rpm, $n_2 = 300$ rpm and power, $P = 7.5$ kw.

OR

18. Explain the different types of control circuits used in EDM process.