Code : 021101

B.Tech 1st Semester Examination, 2016

Elements of Mechanical Engineering

Time : 3 hours *Full Marks : 70*

Instructions :

(i) There are Nine Questions in this Paper

(ii) Attempt five questions in all.

(iii) ***Question No. 1 is Compulsory.***

(iv) The marks are indicated in the right-hand margin

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1. Choose the correct/best answer from the following (any seven) : 2 × 7 = 14

(a) The formation of frost on cooling coils in a refrigerator:

(i) reduces power consumption

(ii) improves C.O.P. of the system

(iii) increases heat transfer

(iv) increases power consumption

(b) Which of the following statement is wrong?

(i) Locomotive boiler is a water tube boiler.

(ii) Water tube boilers are internally fired.

(iii) La-mont boiler is a low pressure water tube bo

(iv) all of the above

(c) Naptha is a volatile colourless product obtained fr

(i) Methyl alcohal

(ii) Sugar cane

(iii) Petroleum

(iv) Vinayl acetate

(d) For the same compression ratio, the efficiency dual combustion cycle is:

(i) less than Diesel cycle and greater than Otto cy

(ii) greater than Diesel cycle and less than Otto cycl

(iii) less than Diesel cycle

(iv) greater than Diesel cycle

(e) While designing the refrigeration system of an aircraft, the prime consideration is that the:

(i) mass of refrigerant circulated in the system is low

(ii) system has high C.O.P.

(iii) mass of the refrigeration equipment is low

(iv) Power per TR is low

(f) The vapour compression refrigerator employs the following cycle:

(i) Rankine

(ii) Carnot

(iii) Reversed Rankine

(iv) Reversed Carnot

(g) The isentropic enthalpy drop in moving blade is two-third of the isentropic enthalpy drop in fixed blades of a turbine. The degree of reaction will be:

(i) 0.56

(ii) 0.4

(iii) 0.5

(iv) 0.67

(h) An aircraft gas turbine operates on:

(i) Sterling cycle

(ii) Rankine cycle

(iii) Otto-cycle

(iv) Bryton cycle

(i) A turbine is said to have an axial discharge w the steam leaves the blade tip at ..... the direction of the blade motion.

(i) 90°

(ii) 180°

(iii) 60°

(iv) 270°

(j) Cold work components are generally subjected t

(i) Annealing

(ii) Hardening

(iii) Tempering

(iv) Shot peening

2. (a) List the various Liquid fuels. State its merits over solid fuels. 7

(b) Differentiate between fire tube and water tube boiler. 7

3. (a) Explain with a neat sketch Lancashire boiler. 7

(b) Five kg of air is heated from initial volume of 0.5 m^3 to final volume of 1.3 m^3 at constant pressure 4 bar. Determine (1) heat supplied (2) workdone (3) initial and final temperature of air. Take=C_p=1.005 kJ/kg-K and R=0.287 kJ/kg-K. 7

4. (a) Differentiate between four-stroke and two-stroke I.C. engines. 7

(b) A sample of wet steam at a pressure of 25 bar absolute has dryness fraction 0.80. Determine its enthalpy and internal energy. 7

5. (a) Explain the various method of case-hardening. 7

(b) What do you understand by mechanical and thermal efficiency? A steam plant uses 3 tonne of coal/hr. The steam is fed to turbine the output of which is 4 MW. The calorific value of the coal is 30 MJ/kg. calculate the thermal efficiency of the plant. 7

6. (a) What is prime mover? How are the classified?

(b) What do you mean by boiler mountings & accessories. List at list five boiler mountings & explain any one with neat sketch. 7

7. (a) Explain with a neat sketch the working of a vapour compression refrigerator. 7

(b) In an ideal Diesel cycle the temperature at the beginning and at the end of compression are 57°C and 603°C. The temperature at the beginning and at the end of expansion are 1950°C and 870°C. Find the ideal efficiency of the cycle. If the pressure is 1 bar find the maximum pressure in the cycle. 7

8. (a) Draw working fluid flow diagram of the Vapour Compression Refrigeration System and describe the function of each important component of the system.

 7

(b) What do you understand by mechanical and thermal efficiency ? A steam plant uses 3 tonne of coal/hr. The steam is fed to turbine the output of which is 4 MW. The calorific value of the coal is 30 MJ/kg. calculate the thermal efficiency of the plant. 7

9 (a) When quenching is desired? Explain the various quenching methods. 7

(b) Discuss briefly tool steels and give its practical application. 7

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