Code : 021101

B.Tech 1st Semester Exam., 2014

ELEMENTS OF MECHANICAL ENGINEERING

Time : 3 hours *Full Marks* : 70

Instructions :

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

*(ii) There are **NINE** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question No. **1** is compulsory.*

1. Answer/Choose the correct option/Fill in the blank of the following (any *seven*) : 2×7=14

(a) Name the process by which a heavy nucleus is splitted into two light nuclei.

(b) Which of the following is extensive property of a system?

(i) Pressure

(ii) Volume

(iii) Temperature

(iv) Density

(c) Fire-tube boilers are restricted to a maximum pressure of ——.

(d) Cooling water is not needed in

(i) gas turbine plant

(ii) steam turbine plant

(iii) diesel engine plant

(iv) nuclear power plant

(e) First law of thermodynamics deals with conservation of

(i) heat

(ii) mass

(iii) momentum

(iv) energy

(f) In vapour compression refrigeration system, the abrupt reduction of pressure takes place in

(i) compressor

(ii) condenser

(iii) throttle valve

(iv) evaporator

(g) Fuel injector is used in —— engine.

(h) Air refrigeration system works on

(i) Bell Coleman cycle

(ii) Otto cycle

(iii) Carnot cycle

(iv) Rankine cycle

(i) The steel used for making cutting tools is

(i) dead steel

(ii) low-carbon steel

(iii) medium-carbon steel

(iv) high-carbon steel

(j) Define resilience.

2. (a) Discuss the merits and demerits of renewable and non-renewable sources of energy with suitable examples. 7

(b) What are the methods of harnessing of solar energy? Explain the principle of wind mill. 7

3. (a) Define open, closed and isolated systems. Classify each with example. 4

(b) Differentiate among heat, work and internal energy. 4

(c) $0{\cdot}2\ m^3$ of air at 4·0 bar and 150 °C expands isentropically to a pressure of 1·0 bar. The gas is then heated at constant pressure till it attains its initial temperature. Determine the change of internal energy and work done. 6

4. (a) What are the differences between fire-tube and water-tube boilers? 6

(b) Name all the mountings and accessories of a steam boiler and describe, with neat sketch, the working of any one of each. 8

5. (a) What is steam turbine? Explain the principle of operation of impulse turbine. 7

(b) State the working principle of a closed cycle gas turbine. Why is it named as constant pressure turbine? 7

6. (a) How are IC engines classified? Draw *p-V* diagrams of Otto and diesel engine cycles. 6

(b) With neat sketches, explain the working of a four-stroke diesel engine. 8

7. *(a)* Describe with a neat sketch the construction and working of a nuclear power plant. 9

(b) Describe the working principle of high head hydel power station. 5

8. *(a)* Differentiate between the following : 8

(i) Refrigeration and airconditioning

(ii) Vapour compression and vapour absorption refrigeration system

(b) With neat sketch, explain the working of a room air conditioner. 6

9. *(a)* What is plain carbon steel? Give the classification of plain carbon steels and their important properties and uses. 8

(b) Define the following terms : 6

(i) Toughness

(ii) Hardness

(iii) Normalizing

(iv) Casehardening

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