Code : 021101

B.Tech 1st Semester Exam., 2013

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

   (a) The primary fuel used in nuclear power
   plant is —.

   (b) Zeroth law of thermodynamics forms
   the basis of — measurement.

   (i) pressure

   (ii) temperature

   (iii) heat exchange

   (iv) work

   (c) The percentage by weight of oxygen in
   atmospheric air is

   (i) 19

   (ii) 21

   (iii) 23

   (iv) 27

   (d) An adiabatic system can exchange
   energy in the form of —— only.

   (e) During refrigeration cycle based on
   vapour compression system, the heat
   rejected by the refrigerant in

   (i) condenser

   (ii) expansion valve

   (iii) evaporator

   (iv) compressor

   (f) The fluids used in the Electrolux
   refrigerator are ammonia, water and
   ——.

   (g) Which of the following is fitted on a
   boiler to improve the boiler efficiency?

   (i) Fusible plug

   (ii) Safety valve

   (iii) Steam stop valve

   (iv) Economizer

(h) Steam power plant works on —— cycle.

(i) —— is used to mix air and fuel in a petrol engine.

(j) Aluminium-copper alloy is called ——.

2. (a) What is the status of nonconventional energy sources in India, and what are their future prospects? 6

(b) What is the origin of biomass energy? What is its global potential? Give its advantages and disadvantages. 8

3. (a) Differentiate between the following : 6
   (i) Heat and work
   (ii) Point function and path function
   (iii) Intensive and extensive properties

(b) Air initially at a pressure of 75 kPa, at a temperature of 1000 K and occupying a volume of $0.12\ m^3$ is compressed isothermally until the volume is halved and subsequently it undergoes further compression at constant pressure till the volume is halved again. Calculate the work done. 8

4. (a) Explain the principles of fire-tube and water-tube boilers. 6

(b) With neat sketch, describe the function of fusible plug and water-level indicator in fire-tube boiler. 8

5. (a) What are the advantages of steam turbines over other prime movers? 5

(b) What are compoundings of an impulse turbine? 4

(c) What are the advantages of gas turbines over I.C. engines? 5

6. (a) Differentiate between two-stroke and four-stroke engines. 5

(b) Explain Otto cycle and derive an expression for efficiency of Otto cycle. 9

7. (a) What are the role of condenser in a thermal power plant? 4

(b) With neat sketch, explain the working of hydel power plant. Mention some hydel plants situated in India. 10

8. (a) Define the following terms : 6
   (i) Refrigeration
   (ii) Air conditioning
   (iii) Unit of refrigeration

(b) Explain with neat sketch, the construction and working of vapour compression refrigeration system. 8

9. (a) What are alloy steels? Why is alloying done? Give some important alloying elements with their effects on steel. 7

(b) What are annealing and tempering? How do they effect on the properties of a substance? 7

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