

Code : 021201

B.Tech 2nd Semester Exam., 2016

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 the following/Choose the correct option (any seven) : $2 \times 7 = 14$

(a) Give two examples of secondary energy sources.

(b) Which quality of coal is most suitable for thermal power plant?

- (i) Peat
- (ii) Lignite
- (iii) Bituminous
- (iv) Anthracite

(c) Ice kept in a wall insulated thermos flask is an example of which system?

- (i) Closed system
- (ii) Isolated system
- (iii) Open system

(iv) Non-flow adiabatic system

(d) The long tube that carries water from the dam to the turbine is called

- (i) spillway
- (ii) draft tube
- (iii) surge tank

(iv) penstock

(e) The processes of generation of steam in the pressure cooker is an example of

- (i) constant pressure process
- (ii) constant volume process
- (iii) constant enthalpy process
- (iv) constant entropy process

(f) In a boiler, the air preheater is invariably located between

- (i) furnace and economiser
- (ii) economiser and chimney
- (iii) economiser and feed pump
- (iv) furnace and feed pump

(g) In an aqua-ammonia absorption refrigeration system, the ammonia vapours are produced at high pressure in the

- (i) absorber
- (ii) condenser
- (iii) evaporator
- (iv) generator

(h) The component which maintains a constant angular motion of the crank within a cycle is called

- (i) flywheel
- (ii) governor
- (iii) crankshaft
- (iv) connecting rod

(i) In a four-stroke cycle diesel engine, during suction stroke

- (i) mixture of fuel and air is sucked in
- (ii) only fuel is sucked in
- (iii) only air is sucked in
- (iv) None of the above

(i) The property of material to resist fracture under impact loading is called

- (i) strength
- (ii) hardness
- (iii) brittleness
- (iv) toughness

2. (a) What are the advantages and disadvantages of renewable sources of energy? 6

(b) What are the applications of solar energy? Discuss the working of a solar plate collector with the help of a suitable neat sketch. 8

3. (a) Explain the thermodynamic equilibrium. 4

57.2 (b) Air initially at a pressure of 75 kPa and temperature of 1000 K and occupying a volume of 0.12 m^3 is compressed isothermally until the volume is halved. Subsequently, the volume undergoes further compression at constant pressure till it is halved again. Calculate the work done. 10

(5)

4. (a) Define a boiler as per IBR. What are the purposes of steam generation? 5
- (b) What is natural and forced circulation boiler? 4
- (c) Explain the working of water level indicator with suitable diagram. 5
5. (a) Explain the working principle of reaction turbine. 5
- (b) State the merits of gas turbine over IC engine. 6
- (c) What are the applications of gas turbine? 3
6. (a) How do you classify IC engines? Represent Otto and Diesel cycle on $p-v$ and $T-S$ plot. 8
- (b) Derive an expression for air standard efficiency of Otto cycle. 6
7. (a) Give the complete layout of steam power plant showing the appropriate position of economiser, air preheater, cooling tower and feed pump. 8
- (b) What are the advantages and disadvantages of hydroelectric power plant? 6

(6)

8. (a) What is the principle of refrigeration? 5
- (b) Compare the vapour absorption refrigeration system with vapour compression refrigeration system. 6
- (c) Define air-conditioning. 3
9. (a) What is heat treatment of metals? What is quenching? 5
- (b) What are the classifications of plain carbon steel? What are their properties and applications? 9
