Code : 021201

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 **EIGHT** questions in this paper.*

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

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

1. Answer/Choose the correct option (any *seven*) : 2×7=14

(a) What is the main constituent of biogas?

(b) First law of thermodynamics deals with conservation of

(i) heat

(ii) work

(iii) momentum

(iv) energy

(c) The process 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

(d) The fusible plug is placed

(i) near the manhole

(ii) just below the water level indicator

(iii) at the crown of furnace

(iv) at the fire grate of boiler

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

(i) only air is sucked

(ii) only diesel is sucked

(iii) mixture of air and diesel is sucked

(iv) None of the above

(f) The absorption refrigeration cycle employs the following device for raising pressure of refrigerant.

(i) Compressor

(ii) Pump

(iii) Generator

(iv) Absorber

(g) The cooling capacity of a refrigerator is expressed in

(i) capacity of compressor

(ii) size of evaporating chamber

(iii) coefficient of performance

(iv) tons of refrigeration

(h) Steam power plant works on

(i) Otto cycle

(ii) Diesel cycle

(iii) Rankine cycle

(iv) Brayton cycle

(i) The percentage of carbon in cast iron usually varies between

(i) 0·1% to 0·2%

(ii) 0·5% to 0·9%

(iii) 1% to 2%

(iv) 2·5% to 3·5%

(j) During normalizing operation, the steel castings are cooled in

(i) air

(ii) an oil bath

(iii) a water bath

(iv) the furnace itself

2. (a) What are the salient features of non-conventional energy sources? 6

(b) What are the methods of harnessing of solar energy? Explain the working of a solar flat collector. 8

3. Define 'boiler'. Draw a neat labeled diagram of a Cochran boiler showing placement of the different mountings on it and also write the function of each mounting. 14

4. (a) How are internal combustion engines classified? 5

(b) Explain the working of a four-stroke diesel engine with suitable sketches. 9

5. (a) What is compounding of an impulse turbine? 4

(b) State the principle of working of an open-cycle gas turbine. 5

(c) What are the advantages of gas turbines over steam turbines? 5

6. (a) Define the following : 6

(i) COP

(ii) Unit of refrigeration

(iii) Air conditioning

(b) Explain with neat sketch the principle and construction of vapour absorption refrigeration system. 8

7. *(a)* Describe with neat sketch the working principle of high-head hydel power plant. What are its advantages over other power plants? 9

(b) Explain the use of cooling tower in thermal power plant. 5

8. *(a)* Define the following mechanical properties : 6

(i) Strength

(ii) Hardness

(iii) Ductility

(iv) Toughness

(b) Explain various case-hardening processes of steel. 8

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