

Code : 021201

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

- (a) Give two examples of primary sources of energy.
- (b) Zeroth law of thermodynamics forms the basis of — measurement.
 - (i) pressure
 - (ii) temperature
 - (iii) volume
 - (iv) work

(c) Difference between the pressure of a fluid and the pressure of atmosphere is called as

- (i) Absolute pressure
- (ii) Barometric pressure
- (iii) Gauge pressure
- (iv) Vacuum pressure

(d) Heat supplied to a system equals the work done in case of a non-flow process carried out

- (i) isochorically
- (ii) isobarically
- (iii) adiabatically
- (iv) ~~isothermally~~

(e) Which of the following fittings is a boiler mounting?

- (i) Superheater
- (ii) Feed check valve
- (iii) Economiser
- (iv) Air preheater

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- (f) The number of valves in a single-cylinder two-stroke petrol engine is
- one
 - two
 - four
 - zero
- (g) How many degrees a crankshaft rotates in completing the cycle of two-stroke engine?
- (h) The condenser in which there is direct contact between the steam and the cooling fluid should be
- surface condenser
 - jet condenser
 - evaporative condenser
 - All of the above
- (i) 1 ton of refrigeration effect is equal to
- 3.5 kJ/s
 - 55 kJ/s
 - 200 kJ/s
 - 210 kJ/s

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- (j) The ability of a material to resist wear is called
- strength
 - toughness
 - hardness
 - brittleness
2. (a) Explain the merits and demerits of renewable and non-renewable sources of energy. 7
- (b) What is the origin of biomass energy? Give the main advantages and disadvantages of biomass energy. 7
3. (a) Differentiate between the following : 7
- Intensive and Extensive property
 - Point and Path function
- (b) A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3 . Assuming that the pressure and volume are related by $pv^n = \text{constant}$, find the work done by the gas system. 7
4. (a) Classify the different types of boilers. Differentiate between fire-tube and water-tube boilers. 7

- (b) Classify mountings into safety fittings and control fittings. Explain with neat sketch any one of each. 7
- 5/ (a) Derive an expression for air standard efficiency of Otto cycle. 7
- (b) Differentiate between two-stroke and four-stroke engines. 7
6. (a) With neat sketch, explain briefly the working principle of an impulse turbine. 6
- (b) Write the application of gas turbine. What are the advantages and disadvantages of gas turbine over IC engine? 8
7. (a) Why is steam condensor used in thermal power plant? 5
- (b) Describe with neat sketch the construction and working of a nuclear power plant. 9
8. (a) Explain Bell-Coleman air refrigeration cycle. 6
- (b) Explain with neat sketch, the working of vapour compression refrigeration system. 8

9. (a) What is plain carbon steel? Give classification of plain carbon steels with their important properties. 7
- (b) What are the objectives of heat treatment? Explain the heat treatment process by tempering. 7

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