

Code : 021101

## B.Tech 1st Semester Exam., 2014

ELEMENTS OF MECHANICAL  
ENGINEERING

Time : 3 hours      akubihar.com      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) :       $2 \times 7 = 14$

- (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      akubihar.com
  - (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 **akubihar.com**  
 (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)  $0.2 \text{ m}^3$  of air at 4.0 bar and  $150^\circ\text{C}$  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. **akubihar.com** 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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