



[4161] – 111

May - June - 2012

Seat No.	
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F.E. (Semester – II) Examination, 2012
BASIC MECHANICAL ENGINEERING
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions:**
- 1) Answer **any one** question from **each** Unit.
 - 2) Answer to the **two** Sections should be written in **separate** answer books.
 - 3) Black figures to the **right** indicate full marks
 - 4) **Neat** diagrams must be drawn **wherever** necessary.
 - 5) **Use** of electronic pocket calculator is **allowed**.
 - 6) Assume suitable data, if necessary.

SECTION – I

UNIT – I

1. A) What do you understand by Reversible and Irreversible process ? State the causes which make any process Irreversible . 6
B) Define and write equations for the following :
i) Adiabatic Index
ii) Enthalpy. 4
- C) A system contains 0.15 m^3 of air at 5 bar and 350° K . A reversible adiabatic expansion takes place till the pressure falls to 1 bar . The gas is then heated at constant pressure till enthalpy increases by 70 KJ. Calculate
i) Work done in individual process.
ii) Index of expansion if the above processes are replaced by a single reversible polytropic process giving the same initial and final states.

Take for air, $C_p = 1.005 \text{ KJ/kgK}$, $C_v = 0.718 \text{ kJ/kgk}$,

$R = 0.287 \text{ kJ/kgk}$.

6

OR

P.T.O.



2. A) State and explain Second Law of Thermodynamics. 6
- B) Define the following :
i) Heat Engine
ii) Heat Pump. 4
- C) A 'Closed vessel' contains 2 kg of carbondioxide at temperature 20°C and pressure 0.7 bar. Heat is supplied to the vessel till the gas acquires a pressure of 1.4 bar. Calculate
i) Final temperature
ii) Work done on or by gas
iii) Heat added
iv) Change in internal energy.
- Assume, $C_v = 0.657 \text{ kJ/kg. K.}$ 6

UNIT – II

3. A) Give classification of I.C. Engine with applications. 6
- B) Explain with neat sketch working of Window Air Conditioning System. How does split Air conditioner differ from Window Air conditioner ? 10
- OR
4. A) How Boilers are classified ? State any four mounting and their functions. 6
- B) Describe with a block diagram and state the applications of the following : 10
i) Double Acting Reciprocating Pump
ii) Reciprocating Air compressor.

UNIT – III

5. A) Explain concept of series and parallel thermal resistances in composite slab. 5
- B) Derive an expression for heat conduction through an infinitely long hollow cylinder. 5
- C) Compare Thermal and Nuclear Power plants on any four parameters. Draw sketch of Nuclear power plant. 8

OR



6. A) Explain concept of Thermal Resistance with Electrical analogy for two slabs. 5
- B) Explain working of 'Solar-Wind Hybrid Power Plant' with sketch. 5
- C) A steam pipeline having internal diameter 150 mm and external diameter 160 mm, is carried with an insulating material of thickness 100 mm having a thermal conductivity of $0.08 \text{ W/m-}^\circ\text{K}$. The temperature of outside surface of the insulating material is 50°C and that of inside surface of the pipeline is 400°C . If the thermal conductivity of the pipe material is $50 \text{ W/m-}^\circ\text{K}$, then find the loss of heat per meter length of the pipe and the temperature at the interface of the tube and insulation ? 8

SECTION – II

UNIT – IV

7. A) Define 'Machine' and 'Machine element'. How machine elements are classified ? Difference between 'Line shaft' and 'Counter shaft' with diagram. (2+2+4=8)
- B) How the couplings are classified and write short notes on 'Oldham's coupling' and 'Universal coupling' ? (2+3+3=8)

OR

8. A) What is a flywheel ? State its functions. What are types of flywheel and their applications ? (4+4=8)
- B) Define 'Gear Ratio' and explain with neat sketches 'Herringbone gears' and 'Worm and worm wheel'. (2+3+3=8)

UNIT – V

9. A) Explain Resistance welding. What are advantages, limitations and applications of resistance welding ? Explain types of resistance welding in brief. (3+3+3=9)
- B) Explain the various design consideration in machine design. Explain aesthetic and ergonomic consideration in product design. (3+3+3=9)

OR



10. A) Explain stress strain diagram for mild steel with neat sketch. Show its salient features.

Explain factor of safety and parameters affecting selection of factor of safety.

(3+3+3=9)

- B) Explain the following sheet metal processes :

- i) Punching
- ii) Perforating
- iii) Lancing
- iv) Blanking

Explain the curling and wire drawing process.

(4+3+2=9)

UNIT – VI

11. A) Explain following operations carried out on Lathe machine with neat sketches,

- i) Eccentric turning
- ii) Taper Turning
- iii) Knurling
- iv) Thread cutting.

(2+2+2+2=8)

- B) Draw a neat sketch of 'column and knee type milling machine'. Explain its basic elements and their working.

(3+5=8)

OR

12. A) What is CNC machine tool ? Explain the working of CNC machine tool with neat block diagram. What are the advantages and disadvantages of CNC machine tool ?

(4+2+2=8)

- B) Explain the following operations performed on milling machine with neat sketches :

- i) Up milling
- ii) Down milling
- iii) Gang milling
- iv) Profile milling.

(2+2+2+2=8)