

Total No. of Questions : 12]

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[3861]-160

F. E. (Semester - II) Examination - 2010

BASIC MECHANICAL ENGINEERING

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- (1) Solve Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10, Q. No. 11 or 12.
- (2) Answers to the **two sections** should be written in **separate answer-books**.
- (3) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (4) Assume suitable data, if necessary.

SECTION - I

- Q.1)** (A) Define : System, Isothermal Process, Specific Properties, Specific Heat, Internal Energy. [1x5=05]
- (B) Explain : COP and Efficiency with its relation. [3+3=06]
- (C) In a certain thermodynamic process of an ideal gas, the volume changes from 0.2m^3 to 0.5m^3 , while pressure changes as per $P = 150 \left[\left(\frac{V}{100} \right) + 1 \right]$, where P is in N/m^2 and V is in m^3 . Find work done by gas in kJ. [05]

OR

- Q.2)** (A) Derive equation for work done in Constant Volume and Constant Pressure Process. [05]
- (B) Classify the following into Intensive and Extensive Properties : Pressure, Enthalpy, Energy, Volume, Weight. [1x5=05]

- (C) Heat Pump is used to maintain house at 23°C . The house is losing heat to outside air through walls at $60,000 \text{ kJ/hr}$. While energy generated in house by various appliances is $4,000 \text{ kJ/hr}$. For a COP of 1.5, find required power input in kW, supplied to the heat pump. [06]

Q.3) (A) Draw labelled sketch of any one Boiler. [05]

(B) Explain principle of working of a Reciprocating Compressor with block diagram. [3+3=06]

(C) Draw labelled sketch of Vapour Compression Refrigeration System. Define COP. [5+1=06]

OR

Q.4) (A) Draw labelled sketch of Two Stroke SI Engine. [05]

(B) How boilers are classified ? [06]

(C) State uses of Compressed Air. [06]

Q.5) (A) Explain use of Solar Energy for any one application. [05]

(B) State advantages and disadvantages of Thermal Power Plant. [3+3=06]

(C) A wire 1.5mm in diameter and 150mm long is submerged in fluid. An electric current is passed through wire and is increased until the fluid reaches 100°C . Under the condition if convective heat transfer coefficient is $4500 \text{ W/m}^2\text{C}$, find how much electrical power must be supplied to wire to maintain wire surface at 120°C ? [06]

OR

Q.6) (A) Draw labelled sketch of Nuclear Power Plant. [3+2=05]

(B) State advantages and disadvantages of Hydro-power Plant. [3+3=06]

- (C) Calculate rate of heat transfer per m^2 through wall of 200 mm thick inner layer of 'A', a central layer of 'B' 100mm thick and a outer layer of 'C' 100mm thick. Temperature of gas in the furnace is 1670°C with $h_{\text{in}} = 74 \text{ W/m}^2\text{C}$ and outside surface temperature of 'C' is 70°C .

Given :

$$K_A = 1.25 \text{ W/m}^\circ\text{C}$$

$$K_B = 0.074 \text{ W/m}^\circ\text{C}$$

$$K_C = 0.55 \text{ W/m}^\circ\text{C}$$

Assume steady state, 1-D flow of heat.

[06]

SECTION - II

- Q.7) (A) What is Brake ? How it differs from Clutch ? Explain Internal Expanding Brake with figure. [2+2+4=08]
- (B) Explain four bar mechanism. What do you mean by inversions of mechanism ? Explain. [4+4=08]

OR

- Q.8) Explain with neat sketch : [4x4=16]
- (a) Bevel Gears
 - (b) Ball Bearing
 - (c) Open Belt Drive
 - (d) Transmission Shaft

- Q.9) (A) Explain Stress-Strain Diagram for Ductile Material. Show its salient features. [4+4=08]
- (B) Describe any four properties of Engineering Materials. [4x2=08]

OR

Q.10) (A) Draw neat sketches of the following Sheet Metal Working Processes : **[4x2=08]**

- (a) Embossing
- (b) Punching
- (c) Bending
- (d) Perforating

(B) Describe any four Non-metallic Materials. **[4x2=08]**

Q.11) (A) Draw block diagram of Lathe Machine and explain functions of its various parts. **[4+5=09]**

(B) Draw block diagram of Vertical Milling Machine and explain functions of its basic elements. **[4+5=09]**

OR

Q.12) (A) Draw labelled sketch of Radial Drilling Machine. State its applications. **[5+1=06]**

(B) Draw neat sketch of Power Saw, name its parts and explain its working. **[3+3=06]**

(C) State advantages, limitations and applications of CNC Machine Tool. **[2+2+2=06]**