[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

$P = 150 \left[\left(V/100 \right) + 1 \right]$, 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 kJ/hr. While energy generated in house by various appliances is 4,000 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 W/m^2°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 m² 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 furnance is 1670°C with h_{in} = 74 W/m²°C and outside surface temperature of 'C' is 70°C.

Given :

K_A = 1.25 W/m°C

K_B = 0.074 W/m°C

K_C = 0.55 W/m°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

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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]

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