First/Second Semester B.E. Degree Examination, June 2012
Elements of Mechanical Engineering

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE full questions choosing at least two from each part.*
     2. *Answer all objective type questions only on OMR sheet page 5 of the Answer Booklet.*
     3. *Answer to objective type questions on sheets other than OMR will not be valued.*
     4. *Use of steam tables is NOT permitted.*
     5. *Any missing data may be suitably assumed.*

PART – A

1 a. Choose your answers for the following :   **(04 Marks)**
   i)   Fossil fuels are
        A) solid fuel   B) liquid fuel   C) gaseous fuel   D) all of these.
   ii) The water tubes in Babcock-Wilcox boiler are inclined to
        A) Improve radiation heat transfer   B) Improve convective heat transfer
        C) Accommodate the furnace   D) Promote natural convection of water
   iii) With increase in pressure, the enthalpy of dry saturated steam
        A) increases   B) decreases
        C) remains same   D) first increases and then decreases
   iv) The specific volume of water, when heated at $0^{\circ}C$
        A) first increases and then decreases   B) first decreases and then increases
        C) increases steadily   D) decreases steadily.

   b. List any four sources of energy, with suitable examples.   **(04 Marks)**
   c. Describe with a neat sketch, the working of a Babcock-Wilcox boiler. Indicate clearly the direction of flow of flue gases.   **(08 Marks)**
   d. Find the enthalpy of 1.0 kg of steam at 20 bar when
      i) it is wet with dryness fraction of 0.9
      ii) it is super heated with its temperature of $350^{\circ}C$.
      [Take specific heat of super heated steam as 2.3 kJ/kgK and properties of steam at 20 bar as $t_{sat} = 212.4^{\circ}C$, $h_f = 908.6$ kJ/kg, $h_{fg} = 1888.6$ kJ/kg]   **(04 Marks)**

2 a. Choose your answers for the following :   **(04 Marks)**
   i)   ……… turbine is an example of impulse turbine.
        A) De-Laval   B) Kaplan   C) Francis   D) Lawn sprinkler
   ii) A gas turbine as compared to a diesel engine takes longer time to accelerate to full speed because
        A) gas turbine has lesser maximum pressure
        B) diesel engine has larger number of bearings
        C) gas turbine has larger rotating mass
        D) gas turbine needs no water cooling.
   iii) Kaplan turbine is efficient and preferred when
        A) low head and low discharge is available
        B) low head and high discharge is available
        C) high head and low discharge is available
        D) high head and high discharge is available.
   iv) Cooling water is not needed in
        A) gas turbine plant   B) diesel engine plant
        C) steam turbine plant   D) nuclear plant

2 b. With neat sketches, explain compounding of an impulse turbine. **(06 Marks)**

c. With a neat sketch, explain the construction and working of a closed cycle gas turbine plant.
(06 Marks)

d. Classify water turbines. **(04 Marks)**

3 a. Choose your answers for the following : **(04 Marks)**
   i) The overall efficiency of an I.C. engine is
      A) mechanical efficiency   B) brake thermal efficiency
      C) indicated thermal efficiency   D) none of these
   ii) The air fuel ratio in a petrol engine is governed by
      A) injector   B) governor
      C) carburetor   D) fly wheel
   iii) The ratio of speed of the camshaft to speed of the crank shaft in a four stroke cycle engine is
      A) 1 : 2   B) 2 : 1
      C) 1 : 1   D) none of these
   iv) For the same speed and power, the size of the flywheel of a four stroke petrol engine is
      A) same as that of 2-stoke petrol engine
      B) larger than that of 2-stroke petrol engine
      C) smaller than that of 2-stroke petrol engine
      D) all of these.

b. Explain with a neat sketch, working of a two stroke petrol engine. **(06 Marks)**

c. A single cylinder two stroke petrol engine develops 7.5 kW at 2500 rpm. The mean effective pressure on the piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of the cylinder if stroke to bore ratio is 1.5. Also calculate the fuel consumption rate, if brake thermal efficiency is 28%. The calorific value of the fuel is 43900 kJ/kg. **(10 Marks)**

4 a. Choose your answers for the following : **(04 Marks)**
   i) An ideal refrigerant should have
      A) low freezing point   B) low boiling point
      C) high latent heat of vapourization   D) all of these.
   ii) In vapour-absorption refrigeration system …........… is/are used to pressurize the refrigerant
      A) a pump and generator   B) a compressor
      C) both of (A) and (B)   D) none of these.
   iii) Refrigeration is a process of heat extraction from
      A) a hot body and delivered to a cold body with the help of external work
      B) a cold body and delivered to a hot body without the help of external work
      C) a cold body and delivered to a hot body with the help of external work
      D) a hot body and delivered to a cold body without the help of external work.
   iv) Air conditioning is a process of
      A) control of temperature   B) control of humidity
      C) control of cleanliness and air motion   D) all of these.

b. Define : i) COP of refrigeration,   ii) Ton of refrigeration. **(04 Marks)**

c. Draw a neat sketch of vapour compressor refrigeration system. Indicate the state of the refrigerant at all salient points and direction of flow of refrigerant. **(06 Marks)**

d. Describe room air conditioner with a simple sketch. **(06 Marks)**

PART – B

5 a. Choose your answers for the following : **(04 Marks)**
     i)   Which of the following parts is not present in lathe
        A) spindle   B) knee
        C) bed   D) slide
     ii)   Which of the following operations can be carried out on lathe
        A) knurling   B) facing
        C) thread cutting   D) all of these
     iii) ……….. is the operation of enlarging a hole by a single point cutting tool.
        A) reaming   B) counter sinking
        C) boring   D) all of these
     iv) Drilling machine can be specified based on
        A) max.dia. of drill   B) spindle travel
        C) power of the motor   D) all of these
  b. With a neat sketch, explain taper turning on lathe by swiveling of compound slide. **(06 Marks)**
  c. Classify drilling machines. **(04 Marks)**
  d. With neat sketches, explain : i) counter sinking, ii) counter boring, iii) reaming. **(06 Marks)**

6 a. Choose your answers for the following : **(04 Marks)**
     i)   ……….. is a machine tool that removes metal as the work is fed against a rotating multipoint cutter.
        A) lathe   B) drilling machine
        C) shaping machining   D) milling machine.
     ii)   In a horizontal milling machine, the rotating spindle is called as
        A) cutter   B) yoke
        C) arbor   D) over-arm
     iii) Which of the following are natural abrasives
        A) sand stone   B) corundum
        C) diamonds   D) all of these
     iv) …….. grinding produces flat surface.
        A) cylindrical   B) surface
        C) form   D) none of these
  b. Distinguish between up milling and down milling. **(04 Marks)**
  c. With a neat sketch, explain the working of vertical milling machine. **(08 Marks)**
  d. List the applications and advantages of centreless grinding. **(04 Marks)**

7 a. Choose your answers for the following : **(04 Marks)**
     i)   Spot welding is an example of
        A) gas welding   B) resistance welding
        C) TIG welding   D) arc welding
     ii)   Which of the following can act as a lubricant?
        A) oil   B) grease   C) graphite   D) all of these
     iii) ……….. is the property which enables oil to spread over and adhere to the surface of bearing.
        A) oiliness   B) flash point   C) specific gravity   D) density
     iv) Which of the following is demerit of ball bearing
        A) less friction   B) requires less lubrication
        C) compact   D) none of these

7 b. Distinguish between soldering, brazing and welding. **(06 Marks)**
c. List the basic requirements of a good lubricant. **(04 Marks)**
d. Describe with a neat sketch, working of a bushed bearing. **(06 Marks)**

8 a. Choose your answers for the following : **(04 Marks)**
    i) Belt drives are preferred when the distance between the shaft centers is
       A) very small   B) large
       C) any distance   D) none of these
    ii) ……… gears connect two non-parallel, non-intersecting shafts which are usually at right angles.
       A) spur   B) bevel
       C) worm   D) none of these
    iii) In a clock mechanism ……. Gear train is used to connect minute hand and hour hand.
       A) simple   B) compound
       C) epicyclic   D) none of these
    iv) Number of teeth on a wheel per unit of its pitch diameter is called
       A) addendum   B) deddendum
       C) diametral pitch   D) circular pitch
b. Derive an expression for the length of the belt in a crossed flat belt drive. **(06 Marks)**
c. Name different gear drives and mention their applications. **(04 Marks)**
d. With neat sketches, explain : i) simple gear train, ii) compound gear train. **(06 Marks)**

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