First/Second Semester B.E. Degree Examination, June/July 2015
Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, selecting at least two from each part.
   2. Use of steam table is permitted.

PART - A

1 a. Choose the correct answers for the following: (04 Marks)
   i) Wind energy is an example for ______
      A) capital energy    B) celestial energy
      C) transitional energy D) stored energy
   ii) Renewable energy sources are
      A) hazardous to environment
      B) exhaustible
      C) non-exhaustible    D) not freely available
   iii) The amount of heat required to increase the temperature of dry steam above its
        saturation temperature is called as ______
        A) sensible heat
        B) enthalpy of superheat
        C) enthalpy of superheated steam
        D) latent heat
   iv) ______ is used to extinguish the fire in the furnace of the boiler when water level falls
        too much below the normal level.
        A) blow-off cock
        B) steam stop valve
        C) water level indicator
        D) fusible plug.

b. A steam at 10 bar and dryness fraction 0.98 receives 140 kJ/kg at the same pressure. What is
   the final state of steam? Also find the density of steam in its final state. Take, \( C_p \) for
   superheated steam = 2.1 kJ/kg K. (08 Marks)

c. With a neat sketch, explain the working of a water tube boiler. (08 Marks)

2 a. Choose the correct answers for the following: (04 Marks)
   i) Delaval turbine is ______
      A) impulse water turbine
      B) gas turbine
      C) impulse steam turbine
      D) none of the above
   ii) Gas turbines mainly used in
      A) aviation
      B) electric power generation
      C) A only
      D) both A and B
   iii) Runner of a water turbine converts
      A) pressure energy into mechanical energy
      B) kinetic energy into mechanical energy
      C) pressure energy into kinetic energy
      D) none of the above
   iv) Draft tube is a part of
      A) Pelton wheel
      B) Kaplan turbine
      C) Delaval turbine
      D) Parsons turbine

b. Mention the function of following: i) braking jet    ii) scroll casing    iii) penstock
   iv) convergent-divergent nozzle. (04 Marks)

c. What do you mean by compound of steam turbine? Why it is necessary? With a neat sketch,
   explain velocity compounding. (12 Marks)
3. a. Choose the correct answers for the following:
   i) The following is a SI engine
      A) diesel engine       B) petrol engine       C) gas engine       D) both B and C
   ii) The thermal efficiency of petrol engine as compared to diesel engine is
      A) lower       B) higher
      C) same for same power output       D) same for same speed
   iii) In diesel cycle engine, heat is supplied at
      A) constant temperature       B) constant volume
      C) constant pressure       D) none of the above
   iv) In four stoke diesel engine, during suction stroke
      A) only air is sucked in       B) only fuel is sucked in
      C) mixture of fuel and air is sucked in       D) none of the above
   
b. Explain with suitable sketches, P-V diagrams, the working of a four stoke Otto engine. (10 Marks)

c. The following particulars were obtained in a trial on 4-stroke engine.
   Duration of trial = 1 hour, revolutions = 14000, Net brake load = 1470 N, mean effective pressure = 7.5 bar, Fuel consumption = 20000 lit, calorific value of fuel = 21 KJ/lit, cylinder diameter = 250mm, stroke = 400 mm effective brake circumference = 4 m.
   Calculate: i) indicated power ii) brake power iii) mechanical efficiency iv) indicated thermal efficiency. (06 Marks)

4. a. Choose the correct answers for the following:
   i) One TOR is equal to
      A) 310 kJ/min       B) 210 kJ/min       C) 110 kJ/min       D) 410 kJ/min
   ii) _______ is used as the refrigerant in vapour absorption refrigeration system
      A) Ammonia       B) Freon - 12       C) Freon - 22       D) R - 134a
   iii) Air conditioning controls
      A) humidity       B) temperature
      C) motion and purity of air       D) all the above
   iv) Throttle valve in a refrigeration system
      A) compresses the refrigerant       B) expands the refrigerant
      C) both A and B       D) none of the above
   
b. Define: i) COP ii) TOR. (03 Marks)

c. Distinguish between refrigeration and air conditioning. (05 Marks)

d. With a schematic diagram, explain the working of a vapour refrigeration system. (08 Marks)

PART - B

5. a. Choose the correct answers for the following:
   i) The lathe part which slides along bed ways is called as
      A) cross slide       B) tool post       C) compound rest       D) saddle
   ii) The lathe operation performed to generate flat surfaces at the end of end of work piece is called as
      A) turning       B) facing       C) knurling       D) thread cutting
   iii) The operation of enlarging one end of a previously drilled hole through a small depth is called as
      A) boring       B) counter sinking       C) counter boring       D) reaming
   iv) Following is the one of the drilling operations
      A) thread cutting       B) facing       C) taper turning       D) spot facing.
   
b. Mention the function of following parts of lathe:
   i) apron ii) compound rest iii) cross slide iv) lead screw v) feed screw vi) tail stock. (06 Marks)

c. With a neat sketch, explain the working of a radial drilling machine. (10 Marks)
6 a. Choose the correct answers for the following: (04 Marks)

i) The thickness of the chip is minimum at the beginning of cut and reaches maximum when the cut ends in
   A) down milling  B) up milling  C) both A and B  D) none of the above

ii) The horizontal shaft provided between tapered hole spindle and bearing in the projecting overarm of milling machine is called as
   A) knee  B) arbor  C) column  D) none of the above

iii) The following is the one of the natural abrasives
   A) silicon carbide  B) cubic boron nitride  C) aluminum oxide  D) corundum

iv) For precision grinding, the wheels with ________ bonding process is used
   A) Resinoid bond  B) vitrified bond  C) silicate bond  D) shellac bond

b. Name and explain with a sketch the milling operation required to produce the following:
   i) V - groove ii) T - slots iii) flat surface iv) convex surface. (08 Marks)

c. With a neat sketch, explain the working of centreless grinding machine. (08 Marks)

7 a. Choose the correct answers for the following: (04 Marks)

i) Oxy-acetelene ratio for carburizing flame is
   A) 1 : 1  B) 1 : 1.2  C) 0.5 : 1  D) 0.95 : 1

ii) Filler metal used in brazing is
   A) Silver  B) lead  C) aluminium  D) lead and tin alloy

iii) The minimum temperature at which the given oil gives off sufficient vapour to ignite is called as
   A) cloud point  B) fire point  C) pour point  D) flash point

iv) Example for antifriction bearing is
   A) Bushed bearing  B) journal bearing  C) roller bearing  D) plummer block

b. With a neat sketch, explain the principle of arc welding. (06 Marks)

c. What are the functions of lubricant? (04 Marks)

d. With a neat sketch, explain pivot bearing. (06 Marks)

8 a. Choose the correct answers for the following: (04 Marks)

i) ________ is used to transmit power from one shaft to another when the centre distance is large
   A) gear drive  B) belt drive  C) gear train  D) none of the above

ii) Bevel gears are used to transmit power when shafts are
   A) parallel  B) non - parallel  C) perpendicular  D) perpendicular and non-intersecting

iii) The ratio of pitch diameter to the number of teeth is called as
   A) circular pitch  B) diametral pitch  C) velocity ratio  D) module

iv) ________ is used for transmitting power when the VR is high and centre distance between the shafts is small
   A) Compound gear train  B) simple gear train  C) reverted gear train  D) epicyclic gear train.

b. Briefly explain the effect of creep and slip on the performance of belt drive. (06 Marks)

c. What is idler pulley? What is its purpose? Explain. (04 Marks)

d. A simple gear train is made up of four gears A, B, C, D having 20, 40, 60, 70 teeth. If gear A is the main driver rotating at 500 rpm clockwise, calculate:
   i) speed of intermediate gears
   ii) speed and direction of last follower
   iii) train value. (06 Marks)