First/Second Semester B.E. Degree Examination, June/July 2011
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 in 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.

PART – A

1   a.   Choose the correct answer:
i)   The steam heated beyond its dry saturated stage is called _____
        A) Dry steam   B) Wet steam   C) Saturated steam   D) Super heated steam

ii)   Sensible heat is also called as _____ .
        A) Enthalpy of saturated water   B) Enthalpy of evaporation
        C) Enthalpy of dry saturated steam   D) Enthalpy of super heated steam.

iii) Economiser is a device used to _____ .
        A) heat the air fed to the furnace
        B) increase the temperature of steam above the saturation temperature
        C) heat the feed water
        D) separate the water particles present in the steam.

iv)   Lancashire boiler is of
        A) fire tube type   B) stationary type   C) horizontal type   D) All of these (04 Marks)

   b.   With a neat sketch, explain the functioning of Ocean Thermal Energy Conversion (OTEC).
                                                                        (06 Marks)

   c.   Find the enthalpy of heat in 2 kg of steam at 0.9 bar and 85% quality. Use the properties of
        steam given below.   (06 Marks)

Saturation pressure (bar)	Saturation temperature (°C)	Specific enthalpy of saturated liquid (kJ/kg)	Specific enthalpy of saturated vapour (kJ/kg)
0.9	96.71	405.21	2670.9

   d.   Differentiate between:
        i)   Boiler mountings and accessories
        ii)   Dry saturated steam and super heated steam.   (04 Marks)

2   a.   Choose the correct answer:
i)   In case of impulse steam turbine there is
        A) pressure drop in fixed and moving blades
        B) pressure drop only in moving blades
        C) pressure drop only in nozzles
        D) pressure drop only is fixed blades

ii)   Curtis turbine is
        A) reaction steam turbine
        B) pressure velocity compounded steam turbine
        C) pressure compounded impulse steam turbine
        D) velocity compounded impulse steam turbine

iii) Mechanical efficiency of a gas turbine plant as compared to IC engine is
    A) higher   B) lower   C) same   D) unpredictable.

iv) Pelton turbine is a
    A) reaction turbine   B) gas turbine
    C) tangential flow turbine   D) mixed flow turbine   **(04 Marks)**

b. With a neat sketch, explain the working of a Pelton wheel.   **(06 Marks)**

c. Explain with a neat sketch, the working of Curtis and Moore impulse turbine.   **(06 Marks)**

d. What are the advantages of gas turbines over IC engines?   **(04 Marks)**

3 a. Choose the correct answer:
    i) The combustion of fuel in petrol engine takes place at
        A) constant pressure   B) constant volume
        C) constant temperature   D) none of these.

    ii) In a four stroke engine, the number of rotations of the crank shaft to complete a working cycle is
        A) 1   B) 2   C) 3   D) 4

    iii) In CI engine, during the suction stroke _____ is sucked in to the cylinder.
        A) diesel   B) diesel and air mixture
        C) diesel and petrol mixture   D) air.

    iv) Scavenging is employed in _____ .
        A) 4-stroke petrol engine   B) 2-stroke petrol engine
        C) 4-stroke diesel engine   D) None of these.   **(04 Marks)**

b. The following observations were recorded during a test on 4-stroke diesel engine:
Bore = 200mm ;   Stroke = 250mm ;   Mean effective pressure = 0.6 MPa
Brake drum diameter = 1.2m; Net brake load = 500N ; Speed of crank shaft = 600 rpm
Find, i) Indicated power ii) Brake power iii) Friction power iv) Mechanical efficiency.   **(10 Marks)**

c. Name the thermodynamic cycle of petrol engine. Draw the PV diagram of the same indicating various processes.   **(06 Marks)**

4 a. Choose the correct answer:
    i) _____ converts vapour refrigerant into liquid refrigerant.
        A) Compressor   B) Evaporator   C) Condenser   D) Motor.

    ii) Throttle valve is used in a refrigerator to _____ .
        A) compress the refrigerant   B) expand the refrigerant
        C) absorb the heat from the refrigerant   D) condense the refrigerant

    iii) Which of the following is not a desirable property of a refrigerant?
        A) High latent heat of vaporization   B) High freezing point
        C) Low viscosity   D) Low specific volume

    iv) The purpose of air conditioning is to
        A) control temperature   B) control humidity
        C) clean and purify air   D) all the above.   **(04 Marks)**

b. With a neat sketch, explain the working of room air conditioner.   **(10 Marks)**

c. Explain vapour absorption refrigeration system with a neat sketch.   **(06 Marks)**

PART – B

5 a. Choose the correct answer:
   i) _____ is not a part of carriage assembly.
      A) Apron   B) Compound slide C) Tool post   D) Tail stock

   ii) _____ is the operation of separating a piece of finished work from the bar stock.
      A) Parting   B) Facing   C) Turning   D) Knurling

   iii) _____ is the process of enlarging the previously drilled hole.
      A) Reaming   B) Boring   C) Tapping   D) Spot facing

   iv) _____ is the process of generating internal threads.
      A) Reaming   B) Boring   C) Tapping   D) Drilling.   (04 Marks)

   b. Sketch and explain the following operations of a drilling machine:
      i) Boring   ii) Counter sinking   iii) Tapping   iv) Spot facing   (12 Marks)

   c. List the specifications of a lathe.   (04 Marks)

6 a. Choose the correct answer:
   i) In _____ process the direction of rotation of cutter and the direction of feed of the workpiece are opposite to each other.
      A) Conventional milling   B) Down milling
      C) Climb milling   D) None of these.

   ii) Milling cutter in horizontal milling machine is held in _____ .
      A) Over arm   B) Column   C) Arbor   D) Knee

   iii) _____ is not an abrasive material used in grinding wheels.
      A) Emery   B) Aluminium oxide C) Corundum   D) Graphite

   iv) In _____ grinding the workpiece is held over a work rest in between two grinding wheels.
      A) cylindrical centre   B) centreless cylindrical
      C) surface grinding   D) None of these   (04 Marks)

   b. Draw a schematic sketch of horizontal milling machine and briefly explain the functions of its main parts.   (10 Marks)

   c. Sketch and explain centreless grinding.   (06 Marks)

7 a. Choose the correct answer:
   i) The metal used to make the brush is _____ .
      A) Mild steel   B) Gun metal   C) Cast iron   D) Copper

   ii) Wick lubrication works on the principle of _____.
      A) gravity flow   B) forced flow   C) siphon   D) free flow

   iii) Spelter is used in
      A) soldering   B) brazing
      C) resistance welding   D) arc welding

   iv) Graphite is used as
      A) filler material   B) flux   C) spelter   D) lubricant.   (04 Marks)

   b. What are the differences between soldering and brazing?   (05 Marks)

   c. Explain with a neat sketch splash lubrication. Where is it used?   (05 Marks)

   d. What are the advantages and disadvantages of sliding contact bearings?   (06 Marks)

8 a. Choose the correct answer:
  i) _____ belts are acid and water proof.
      A) Leather   B) Balata   C) Textile   D) Canvas

  ii) _____ arrangement enables a machine to be started or stopped at will, without stopping the belt run.
      A) Friction cones   B) Compound belt drive
      C) Fast and loose pulley   D) Jockey pulley.

  iii) In simple gear train, if the number of idler gears is odd, then the direction of rotation of driven gear will
      A) be opposite to that of the driving gear
      B) depends on the number of teeth on the driving gear
      C) depends on the speed of driving gear
      D) be same as that of the driving gear.

  iv) Mitre gear is a type of
      A) Spur gear   B) Helical gear   C) Bevel gear   D) Worm gear **(04 Marks)**

  b. Derive an expression for length of belt in cross belt drive.   **(08 Marks)**

  c. In an open belt drive arrangement, the speed of driver and driven pulley are 1000 rpm and 750 rpm respectively. If the diameter of driver pulley is 600 mm, determine the diameter of driven pulley
      i) without considering the thickness of belt and slip
      ii) by considering the thickness of belt, assuming the thickness of belt as 10 mm.
      iii) by considering both thickness of belt and slip, assuming the thickness of belt as 10 mm and overall slip as 5%.   **(08 Marks)**

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PART - A

1. a. Choose the correct answer   (04 Marks)
    i) Energy derived from the fuels existing in the Earth is _____
        A) Capital Energy   B) Stored Energy
        C) Celestial Energy   D) Transitional Energy
    ii) A measure of Quality of wet steam _____
        A) Quality of steam   B) Dryness fraction
        C) Wetness fraction   D) All the above
    iii) Example of a Fire tube Boiler is _____
        A) La – Mount Boiler   B) Babcock and Wilcox Boiler
        C) Locomotive Boiler   D) Stirling Boiler
    iv) Safety valves are used in Boiler for _____
        A) Safety   B) Operation
        C) To increase η   D) None of these
    b. Enumerate the merits and demerits of conventional and non – conventional energies.
                                                                    (06 Marks)
    c. Explain with a neat sketch the working principle of a Lancashire Boiler.   (10 Marks)

2. a. Choose the correct answer   (04 Marks)
    i) Panson's turbine is an example of _____
        A) Impulse turbine   B) Gas turbine
        C) Reaction turbine   D) None of these
    ii) Francis turbine is _____ reaction turbine
        A) Axial flow   B) Mixed flow
        C) Tangential flow   D) Inward flow
    iii) Super charging is supplying additional _____ to the engine cylinder to achieve more η
        A) Fuel   B) Coal
        C) Air   D) Water
    iv) Hydro power is the energy of _____
        A) Air   B) Water
        C) Fuel   D) Wind
    b. Explain with a neat sketch the working principle of constant pressure closed cycle gas turbine.   (06 Marks)
    c. Differentiate between i) Impulse and Reaction turbine   ii) Francis turbine and Kaplan turbine.   (10 Marks)

3. a. Choose the correct answer (04 Marks)
   i) The number of revolutions of crank per cycle for 4 – stroke engine are _____
      A) 1   B) 2   C) 3   D) 4
   ii) Compression ratio of a petrol engine varies from _____
      A) 12 : 1 to 22 : 1   B) 4 : 1 to 10 : 1
      C) 1 : 4 to 1 : 10   D) 1 : 12 to 1 : 22
   iii) Indicated power is given by _____
      A) IP = BP - FP   B) IP = BP/FP
      C) IP = BP + FP   D) All the above
   iv) The power developed at the output end of the engine shaft is called _____
      A) BP   B) IP   C) FP   D) None of these
   b. Explain the working principle of 4 – stroke diesel engine with PV diagram. (10 Marks)
   c. A single cylinder four stroke engine runs at 1000 rpm and has a bore of 115mm and has a stroke of 140mm. The brake load is 60N at 600mm radius and the mechanical efficiency is 80%. Calculate brake power and mean effective pressure. (06 Marks)

4. a. Choose the correct answer (04 Marks)
   i) The working fluid used in refrigerators is _____
      A) Freon - 12   B) Freon - 13
      C) Freon - 22   D) All the above
   ii) The measure of effectiveness of a refrigeration system is _____
      A) COP   B) Mechanical η
      C) Thermal η D) Overall η
   iii) One ton of refrigeration means _____
      A) 35 kW   B) 350 kW   C) 3.5 kW   D) 3500 kW
   iv) _____ is used to control the rate of admission of refrigerant to the evaporator.
      A) Condenser   B) Compressor
      C) Absorber   D) Throttle valve.
   b. With a neat sketch, explain the construction and working principle of a vapour compression refrigeration unit. (10 Marks)
   c. Explain the principle of Air conditioner, also list the applications of Air conditioner. (06 Marks)

PART - B

5. a. Choose the correct answer (04 Marks)
   i) The operation to produce a conical surface called taper is _____
      A) Cylindrical turning   B) Facing
      C) Taper turning   D) Knurling
   ii) A Lathe is specified by _____
      A) Height of Lathe centre from Bed   B) Maximum swing over Bed
      C) Distance between centres   D) All the above
   iii) The portion of the drill which is held in the machine to drive the drill is _____
      A) Body   B) Shank
      C) Point   D) Land
   iv) _____ is the process of generating internal threads.
      A) Tapping   B) Turning
      C) Milling   D) Knurling
   b. Explain with a neat sketch the principle of operation of taper turning by tail stock set over method. (10 Marks)
   c. With a neat sketch explain Radial Drilling Machine. (06 Marks)

6. a. Choose the correct answer   (04 Marks)
   i) The Milling operation in which the cutter rotation is in the same direction of the feed of workpiece is called _____
      A) Down Milling   B) UP Milling
      C) Face Milling   D) None of these
   ii) The process of Machining several surfaces of a workpiece simultaneously at one pass is called _____
      A) Form Milling   B) Angular Milling
      C) Gang Milling   D) Straddle Milling
   iii) _____ is the surface finishing operation.
      A) Lapping   B) Precession Grinding
      C) Rough grinding   D) All the above
   iv) Grinding is also called _____
      A) Abrasive Machining   B) Twisting
      C) Lapping   D) Honing
   b. Explain with a neat sketch knee and column type vertical milling machine.   (08 Marks)
   c. Explain with a neat sketch cylindrical grinding machine.   (08 Marks)

7. a. Choose the correct answer   (04 Marks)
   i) _____ Promotes the fusing of metals and provides a protective layer to the weld from atmospheric contammations
      A) Electrodes (bare)   B) Flux
      C) Electric arc   D) Iron
   ii) Lead and Tin are present in
      A) Hard solder   B) Soft solder   C) Spelter   D) Flux
   iii) _____ is an example of semi liquid lubricant
      A) Vegetable oil   B) Animal oil   C) Mineral oil   D) Grease
   iv) Bearing supporting a vertical shaft is _____
      A) Collor Bearing   B) Pivot Bearing
      C) Ball Bearing   D) Roller Bearing
   b. Write the differences between welding and Brazing.   (06 Marks)
   c. List the properties of lubricants and give the requirements of a good lubricant.
                                                                                  (10 Marks)

8. a. Choose the correct answer   (04 Marks)
   i) Jockey Pulley is used to _____
      A) Change the direction   B) To increase the angle of contact
      C) To change the speed   D) None of these
   ii) _____ gears are used to connect shaft whose axes are perpendicular to each other.
      A) Bevel gear   B) Spur gear
      C) Helical gear   D) Worm gear
   iii) The index of the tooth size is _____
      A) Pitch circle diameter   B) Circular pitch
      C) Module   D) Face width
   iv) _____ gear is used to convert rotory motion into linear motion.
      A) Helical gear   B) Rack and Pinion gear
      C) Spur gear   D) Bevel gear
   b. Explain the following i) Slip ii) Creep iii) Fast and loose pulley.   (06 Marks)
   c. Explain with a neat sketch i) Simple gear train and ii) Compound gear train.
                                                                                  (10 Marks)

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3 of 3