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F.E. (Semester- II) (Revised Course 2007-08)
EXAMINATION Aug/Sept 2019
Basic Mechanical Engineering

[Duration : Three Hours]
[Max. Marks : 100]

Instructions :-
  i) Attempt in **all five** questions. At least **one** question to be attempted from each module.
  ii) Assume missing data, if **any** with proper justification.
  iii) Illustrate with neat sketches where appropriate.

MODULE -I

1 a) State the first law of thermodynamics. List out its limitations and explain how they are overcome in second law. 5

   b) Derive the expression for the first law of thermodynamics applied to a condenser. 5

   c) Plot the following processes on a P-V diagram: 5
      i)   Constant volume
      ii)   Constant pressure
      iii) Isothermal process
      iv)   Adiabatic process
      v)   Polytropic process

   d) A heat pump while operating in a cycle gives the following information: 5
      • Heat added = 150 kJ
      • Heat rejected = 1000 kJ
      • Cyclic work transfer = 800 kJ
      Apply the first and second law to this heat pump and report your findings.

2 a) Prove that $COP_{HP} = COP_{ref} = 1$, where COP is coefficient of Performance, HP is heat pump and ref is refrigerator. 4

   b) Answer the following: 12
      i)   List down the assumptions made for analysis of air standard cycle.
      ii)   Define:
            a. Efficiency of heat engine
            b. Coefficient of performance of heat pump and refrigerator
      iii) Define the terms compression ratio, clearance volume, swept volume and total volume.
      iv)   Differentiate between work transfer and heat transfer.

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c) What is first law of thermodynamics? Write down the expression for the first law applied   4
to:
   i)   A cycle
   ii)   A process

MODULE -II

3   a) An air standard otto cycle has a compression ratio of 8. At the start of the compression   8
        process the temperature is $25^0 C$ and the pressure is 1.5 bar. If the maximum temperature of
        the cycle is 1000 K, calculate
        i)   Net output
        ii)   Thermal efficiency. Take $C_v = 0.718$

     b) Distinguish between two stroke and four stroke engine.   6

     c) Explain with neat sketch the working principle of steam power plant.   6

4   a) Write a short non Multi-Point Fuel Injection (MPFI).   6

     b) What is the function of carburetor & fuel pump I.C. Engine?   6

     c) The following data pertains to petrol engine: 8
        • Cylinder bore (Dia.) 15 cm
        • Stroke length = 10 cm
        • Clearance volume = 300 cm^3
        Calculate the air standard efficiency of the engine.

MODULE -III

5   a) Explain the working principle of a hydraulic steering system.   6
     b) With a neat sketch, explain the construction & working of a single plate clutch.   6
     c) Draw the layout of air brake system and explain its working.   8

6   a) Write a short note on emission control in automobiles.   6
     b) Explain the construction and working of differential in an automobile.   8
     c) Give a brief classification of automobiles.   6

MODULE- IV

7   a) Describe the basic steps involved in a sand casting process.   6
     b) With neat sketches, explain direct and indirect extrusion processes.   8
     c) Compare hot working and cold working processes.   6

8   a) Describe the relative motion between the wok piece and the tool with neat sketches for the   8
        following process:
        i)   Milling ii) Drilling iii) Knurling iv) Taper turning

     b) With neat sketches explain the hot and cold chamber die casting processes.   8
     c) Explain the difference between soldering and brazing.   4

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