OR

With the help of P-V and T-S diagrams. Show that for the same maximum pressure and heat input

$\eta_{diesel} > \eta_{dual} > \eta_{otto}$

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Roll No ....

BE - 203

B.E. I & II Semester

Examination, December 2015

Basic Mechanical Engineering

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) State the material used for making of the following parts, stating reason Twist drill, milling cutter

   b) Compare properties of ferrous and non-ferrous metals.

   c) Define the following properties of material. Ductility, Toughness, Hardness, Creep.

   d) Sketch the iron-carbon equilibrium diagram and point out its salient features.

OR

What is the purpose of testing engineering materials? Explain the following reactions in relation to iron carbon equilibrium diagram.

2. a) Distinguish between
   i) Range and span
   ii) Error and accuracy
   iii) Accuracy and precision

   b) Explain how sine bar used for setting an angle and for finding an unknown angle.

   c) Describe the construction and use of dial gauge.

   d) Explain the principal of operation of rotameter for discharge measurement.

OR

   Describe with a neat sketch, the working of a bimetallic thermometer.

3. a) Distinguish between inward and outward flow reaction turbine.

   b) Distinguish between positive displacement and non-positive displacement compressor.

   c) Sketch the general arrangement of a hydropower plant and state the function of its different components.

   d) Water is flowing through an inclined conical pipe, 100m long. It has 600mm diameter at the upper end and 300mm at the lower end the discharge rate is 50 lit/sec. The pipe has a slope of 1/2:15. Find the pressure at the lower end if the pressure at the upper end is 2.5 bar.

OR

   Water flows through 200mm diameter pipe. The point A and B are at elevation of 6m and 8m, respectively along the inclined pipe. The pressure at A and B are 50 kPa and 20 kPa, respectively if the flow rate is 60 lit/s determine
   i) Direction of low
   ii) Head loss between these points

4. a) What are the properties of good refrigerant?

   b) Prove that $(COP)_R + 1 = (COP)_{H.P}$

   c) "Equivalent evaporation from and at 100°C". Explain the meaning of the term and give the reason for its use in the context of boiler performance.

   d) Obtain an expression for draught produced in mm of water column when the discharge is maximum.

OR

   The pressure volume correlation for a non-flow reversible (quasi-static) process is given by $p=(8-4V)$bar, where V is in m^3. If 150 kJ of work is supplied to the system determine the final pressure and volume of the system. Take initial volume $0.6 \, m^3$.

5. a) What is cutoff ratio? How does it affect the air standard efficiency of an Otto cycle?

   b) How is the mean effective pressure for reciprocating engine defined?

   c) Compare diesel engine with petrol engine with reference to maximum pressure, efficiency power to weight ratio, cost and load control. Give explanation.

   d) A gas engine working on Otto cycle operates with the following parameter's inlet condition 1 bar pressure 320 K temperature compression ratio 4:1 and pressure ratio 4:1. If the working fluid is air with R=287 J/kg k and Y=1.4. Make calculation for useful workdone, thermal efficiency and mean effective pressure.