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Roll No.

BE-204

B. E. (First Semester) EXAMINATION, April, 2009

(Common to all Branches)

BASIC MECHANICAL ENGINEERING

(BE – 204)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all the *five* questions. All questions carry equal marks and internal choice. Assume suitable data if required.

1. Discuss the composition, specific properties and main applications of the following materials : 5 each
 - (i) Mild steel
 - (ii) High carbon steel
 - (iii) High speed steel
 - (iv) Stainless steel

Or

Describe the following mechanical properties of materials ; 4 each

- (i) Tensile strength
- (ii) Hardness
- (iii) Fatigue strength
- (iv) Modulus of elasticity
- (v) Toughness

P. T. O.

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2. Explain the following properties of any measuring instrument : 5 each

- (i) Hysteresis
- (ii) Sensitivity
- (iii) Response time
- (iv) Precision and accuracy

Or

With the help of a simple diagram explain various parts of a lathe machine and also enumerate various operations which can be performed on it. 20

3. What is Newton's law of viscosity. 5, 15

A plate requires 2 N force per unit area or 2 N/m^2 to move with a velocity of 60 cm/sec. over a fixed plate. The distance between two plates is 0.03 mm. Determine the fluid viscosity between the plates.

Or

Derive the Bernoulli's equation from Euler's equation for an ideal flow.

The water is flowing through a pipe having diameters 20 cm at inlet section 1 and 10 cm at outlet section 2. The rate of flow through pipe is 35 litres/sec. The section 1 is 6 m above datum and section 2 is 4 m above datum. If pressure at section 1 is 39.24 N/cm^2 , find the intensity of pressure at section 2. 6, 14

4. Explain the First Law of Thermodynamics with suitable examples.

In a gas turbine the gas enters at the rate of 5 kg/s with a velocity of 50 m/s and enthalpy of 900 kJ/kg and leaves the turbine with a velocity of 150 m/s and enthalpy of 400 kJ/kg.

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The loss of heat from the gases to the surroundings is 25 kJ/kg. Assume for gas $R = 0.285$ kJ/kg °K and $C_p = 1.004$ kJ/kg °K and the inlet conditions to be at 100 kPa and 27°C. Determine the power output of the turbine and the diameter of the inlet pipe. 6, 14

Or

Give the two statements of Second Law of Thermodynamics. Which is the more effective way to increase the efficiency of a Carnot engine : 20

To increase T_1 keeping T_2 constant

Or

To decrease T_2 keeping T_1 constant

where T_1 -source temperature and T_2 -sink temperature.

5. Show that the efficiency of the Otto cycle depends only on the compression ratio. In a S. I. engine working on the ideal Otto cycle, the compression ratio is 5.5. The pressure and temperature at the beginning of compression are 1 bar and 27°C respectively. The peak pressure is 30 bar. Determine the pressure and temperatures at the salient points, the air-standard efficiency and the mean effective pressure. Assume ratio of specific heats to be 1.4 for air. 14

Or

What is the basic difference between an Otto cycle and a Diesel cycle ?

Derive the expression for the efficiency and mean effective pressure of the Diesel cycle. 6, 14