**Benha University Shoubra Faculty of Engineering Mechanical Eng. Dept. (Power) 4thyear (2016-2017)**

**Internal Combustion Engines Sheet No. (4)**

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1. What would be the percentage change in the efficiency of an Otto cycle having a compression ratio 10 when Cv decreases by 1.5%?
2. A petrol engine operates on Otto cycle, the compression ratio is 9, the air to fuel ratio is 15, and the temperature and pressure at the start of compression are 87 oC and 1 bar. When the index of compression 1.33 and The specific heat varies with temperature according to relation: Cv = 0.7 + 2.5\*10-4 T kJ/kg.K, The calorific value of the fuel is 43000 kJ/kg.

Calculate the conditions at the end of the compression process.

1. A spark ignition engine work on the constant volume fuel-air cycle has a compression ratio of 8. At the beginning of compression the pressure and temperature are 1 bar and 360 K. the air to fuel ratio is 15, the calorific value of the fuel is 43000 kJ/kg.K

Calculate: a) The maximum temperature in the cycle.

b) The thermal efficiency.

c) The mean effective pressure.

Take R = 0.268 kJ/kg.K

Cp = 1.0 + 0.00008 T kJ/kg.K during compression.

Cp = 1.0 + 0.0001 T kJ/kg.K during expansion and combustion.

1. The following data relates to a petrol engine:-

Compression ratio=7, C.V. of fuel used =44000kJ/kg, air-fuel ratio =15:1, P and T of charge at the end of suction stoke 1bar and 65 oC, index of compression =1.33, Cv =0.71+20\*10-5T kJ/kg K. Determine the max. Pressure in the cylinder and compare this value with that of constant specific heat Cv=0.71kJ/kg K.

1. In diesel engine the compression ratio is 14, air to fuel ratio is 28, temperature at end of compression is 800 K and combustion is assumed to occur at constant pressure, calorific value of fuel is 42.5 MJ/kg and the effect of dissociation may be assumed to decrease the temperature rise during combustion by 10% of value without dissociation.

Calculate the percentage of stroke in which combustion is completed.

Take R= 0.3 kJ/kg.K and Cp = 1.0 + 0.001 T kJ/kg.K

1. An oil engine, working on the dual combustion cycle, has a compression ratio of 13:1. The heat supplied per kg of air is 2000kJ, half of which is supplied at constant volume and the other half at constant pressure. If the temperature and pressure at the beginning of compression are 100 oC and 1 bar.

Calculate: a) the maximum pressure in the cycle.

b) The percent of stroke when cutoff occurs.

Take R = 0.287 kJ/kg.K and Cp/Cv = 1.4 and Cv= 0.709+0.000028 T kJ/kg.K