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

**Internal Combustion Engines Sheet No. (3)**

1. Explain the difference between Otto cycle and diesel cycle. Derive an expression for the air standard efficiency of diesel cycle. Hence show that efficiency of diesel cycle is always lower than efficiency of Otto cycle for the same compression ratio.
2. The ideal Otto engine working on the air standard has a temperature and pressure at the beginning of 25ºC and 1 bar respectively, and a thermal efficiency of 48%.Determine the pressure and temperature at the end of compression.
3. A petrol engine works on Otto cycle .the pressure, temperature and volume of air at the beginning of compression are 0.93 bar, 38 oC and 0.028 m3 and the pressure at the beginning and end of heat addition are 7.87 bar and 22 bar. If there are 250 cycles per minute, find power developed by the engine and the cycle efficiency.
4. The rotational speed of 4-strock engine working on an ideal Otto cycle is 4000 rpm. The initial pressure and temperature are 100 kPa and 300 k respectively. If the maximum volume to the minimum volume ratio is 11,heat add to system 2000 kJ/kg air and stork volume is 2.2 lit, find the following:

a) The theoretical thermal efficiency

b) The engine's power and m.e.p.

1. An engine working on a theoretical diesel cycle a suction pressure of 100 kpa,air temperature of 300k, and a compression ratio of 16.if the heat add to the cycle is 1500 kj/kg of air . Find the pressure and temperature at the key points in the cycle.
2. Four stroke limited pressure cycle engine working on duel fuel cycle engine operates on 10 lit at 1 bar and 27 ºC per cycle. The addition of heat at constant volume is adjusted for a maximum pressure in cycle of 70 bar and the heat addition at constant pressure continues for 5% of the stroke. If compression ratio 16, calculate:

a) Pressure ratio and cut of ratio

b) Heat added /cycle

c) Heat rejected/cycle

d) Work done per cycle

e) Thermal efficiency

f) Indicated power developed if the engine runs at 1200 r.p.m

Given for air K=1.4 CV=0.718 Cp=1.006

1. The compression ratio of a duel combustion cycle is 14 and the maximum temperature in the cycle is 850 ºC. If the working substance receives equal amounts of heat during both the constant volume and constant pressure processes, determine the air standard efficiency of the cycle .assume the temperature at the start of the cycle is 27 ºC.