**Registration No:** | | | | | | | | | | |

**Total Number of Pages: 2** **M.TECH**

**HTPE101**

# 1st Semester Regular/Back Examination – 2015-16
# INTERNAL COMBUSTION ENGINES

**BRANCH(S): HEAT POWER & THERMAL ENGINEERING,HEAT POWER ENGINEERING,THERMAL ENGINEERING,THERMAL POWER ENGINEERING**

**Time: 3 Hours**

**Max Marks: 70**

**Q.code:T1158**

**Answer Question No.1 which is compulsory and any five from the rest.**

**The figures in the right hand margin indicate marks.**

Q1 Answer the following questions: (2x10)

a) What do you mean term like Squish, Swirl and Tumble in combustion chamber

b) What do you mean by fuel sensitivity and AKI

c) Sketch the idling system in carburetor.

d) Write down different types of nozzles used.

e) What do you understand by the energy requirements of the ignition system?

f) Write the role of glow plug in CI engine?

g) Why is over-cooling in an engine harmful?

h) Draw time Vs cylinder pressure for combustion with and without knock for both SI & CI engine.

i) Sketch the heat balance curves for CI engines.

j) What do you mean by crevice flow and blow by?

Q2 a) A 6 cylinder, 4.8 Ltr, supercharged engine operating at 3500RPM has an overall volumetric efficiency of 158%. The supercharger has an isentropic efficiency of 92% and a mechanical efficiency in its link with the engine of 87%. It is desired that air be delivered to the cylinder to the cylinders at $65^{o}$C and 180 kPa, while ambient conditions are $23^{o}$C and 98 kPa. Calculate (6)

i. Amount of after cooling needed

ii. Engine power lost to run supercharger

b) Compare the actual and fuel-air cycles in diesel engines. (4)

Q3 a) As the flame front reaches the wall of a combustion chamber, reaction stops due to the closeness of the wall, which dampens out all fluid motion and conduct heat away. This unburned boundary layer can be considered a volume 0.1mm thick along the entire combustion chamber surface. The combustion chamber consists mainly of a bowl in the face of the piston which can be approximated as a 3cm diameter hemisphere. Fuel is originally distributed equally throughout the chamber. Calculate the percent of fuel that does not get burned due to being trapped in the surface boundary layer (6)

b) Show by suitable graphs the effect of dissociation on maximum temperature and horse power. Explain the effect of presence of CO on (4)

dissociation.

Q4 a) After injection the fuel must go through a series of events to assure the proper combustion process: Describe all those in detail. (5)

b) As the flame front reaches the wall of a combustion chamber, reaction stops due to the closeness of the wall, which dampens out all fluid motion and conduct heat away. This unburned boundary layer can be considered a volume 0.1mm thick along the entire combustion chamber surface. The combustion chamber consists mainly of a bowl in the face of the piston which can be approximated as a 3cm diameter hemisphere. Fuel is originally distributed equally throughout the chamber. Calculate the percent of fuel that does not get burned due to being trapped in the surface boundary layer (5)

Q5 a) An automobile has a 3.2Ltr, 5 cylinder, and 4stroke cycle diesel engine operating at 2400RPM. Fuel injection occurs from $20^{o}$bTDCto $5^{o}$aTDC. The engine has volumetric efficiency of 0.95and operates with fuel equivalence ratio of 0.8. light diesel fuel is used. Calculate (5)

i. Time for one injection
ii. Fuel flow rate through an injector

b) In the above problem has a compression ratio of 18:1and operates on an air standard dual cycle at 2400RPM. Combustion starts at $7^{o}$bTDC and lasts for 42o of engine rotation. The ratio of connecting rod length to crank offset is R =3.8. calculate (5)

i. Ignition delay
ii. Cycle cut-off ratio

Q6 a) The spark plug is fired at 18° bTDC in an engine running at 1800 RPM. It takes 8° of engine rotation to start combustion and get into flame propagation mode. Flame termination occurs at 12° aTDC. Bore diameter is 8.4 cm and the spark plug is offset 8 mm from the centreline of the cylinder. The flame front can be approximated as a sphere moving out from the spark plug. Calculate the effective flame front speed during flame propagation. (5)

b) Discuss Fault diagnosis of S.I. Engines. (5)

Q7 a) Discuss about Three way catalytic converter (5)

b) Describe the methods of charge stratification by carburetor alone. (5)

Q8 Write short notes (any two) (5+5)

a) Variable valve timing of engine
b) Dual fuel and multi fuel engines
c) Wankel rotary combustion engine