

**B. Tech. DEGREE EXAMINATION, MAY - 2015**

**(Examination at the End of Third Year)**

**MECHANICAL ENGINEERING**

**Paper - V : I.C. Engines and Gas Turbines**

**Time : 3 Hours**

**Maximum Marks : 75**

*Answer question No. 1 is compulsory*

*(15)*

*Answer ONE question from each unit*

*(4 x 15 = 60)*

- 1) a) Differentiate between a flywheel and a governor.  
b) Define the terms pre-ignition and detonation.  
c) What is meant by ignition delay?  
d) What are causes of knock in C.I. Engines?  
e) Define the terms Bore, Stroke, Swept volume, compression ratio and clearance volume.  
f) Write a short note on fuels used for gas turbines.  
g) State the fundamental differences between the jet propulsion and Rocket propulsion.

**Unit - I**

- 2) Explain classification of I.C. Engines. Draw the valve timing diagram for 4-stroke engine and briefly explain the working principle of it.

OR

- 3) a) Explain the working principle of simple carburettor with a neat sketch.  
b) Comparison between a Flywheel and a Governor.

**Unit - II**

- 4) A 2-cylinder C.I engine with a compression ratio 14 : 1 and cylinder dimensions of 200 mm × 250 mm works on two stroke cycle and consumes 14 kg/h of fuel while running at 300 r.p.m. The relative and mechanical efficiencies of engine are 65% and 76% respectively. The fuel injection is effected upto 5% of stroke. If the calorific value of the fuel used is given as 41800 kJ/kg. Calculate the mean effective pressure developed?

OR

- 5) What is combustion of fuels? Explain in detail combustion analysis, And types.

### Unit – III

- 6) a) What is combustion process? In S.I Engines and C.I Engines?  
b) Write a short notes on octane number and cetane number.

OR

- 7) An axial flow compressor with an overall Isentropic efficiency of 85% draws air at 20°C and compress it in the pressure ratio 4 :1, The mean blade speed and flow velocity are constant throughout the compressor. Assuming 50% reaction blading and taking blade velocity as 180 m/s and work input factor as 0.82 calculate :
- i) Flow velocity.  
ii) Number of stages.

### Unit – IV

- 8) a) Draw the schematic layout of gas turbine cycle with regenerator, reheating and intercooler? Explain salient features.  
b) What do you mean by jet propulsion?

OR

- 9) In a jet propulsion unit air is drawn into the Rotary compressor at 15°C and 1.01 bar and delivered at 4.04 bar. The isentropic efficiency of compression is 82% and the compression is uncooled. After delivery the air is heated at constant pressure until the temperature reaches 750°C. The air then passes through a turbine unit which drives the compressor only and has an isentropic efficiency of 78% before passing through the nozzle and expanding to atmospheric pressure of 1.01 bar with an efficiency of 88%. Neglecting any mass increase due to the weight of the fuel, determine :
- i) The power required to drive the compressor.  
ii) The air-fuel ratio if the fuel has a calorific value of 42000 KJ-Kg.  
iii) The pressure of the gases leaving the turbine.  
iv) The thrust per kg of air per-second.

