

Code: ME4T3

II B.Tech - II Semester – Regular Examinations - JUNE 2015

**IC ENGINES AND GAS TURBINES
(MECHANICAL ENGINEERING)**

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Discuss briefly about exhaust blow down in IC engines.
6 M
- b) Define volumetric efficiency of an engine and discuss the effect of various factors affecting the volumetric efficiency.
8 M
2. a) With a neat sketch, explain the working principle of a four stroke SI engine.
7 M
- b) Explain the various mechanisms of lubrication bringing out their functions.
7 M
3. a) Explain the stages of combustion in SI engines elaborating the flame front propagation.
7 M
- b) What is meant by abnormal combustion? Explain the phenomena of knocking in SI engines.
7 M

4. a) What is delay period and what factors affect the delay period in CI engines? 6 M
- b) Explain the stages of combustion in CI engines. 8 M
5. The air flow to a four cylinder, four stroke gasoline engine was measured by means of a 8 cm diameter sharp edge orifice having a coefficient of discharge of 0.65. During a test on the engine the following data were recorded:
bore=10 cm, stroke = 15 cm, speed = 2500 rpm,
brake power = 36 kW, fuel consumption =10 kg/h,
calorific value = 42 MJ/kg, pressure drop across orifice is 4 cm of water, ambient temperature and pressure are 17⁰ C and 1 bar respectively. Calculate: 14 M
- i) Brake thermal efficiency
- ii) Brake mean effective pressure
- iii) Volumetric efficiency based on free air conditions.
6. a) What are the advantages and disadvantages using CNG in IC Engines? 8 M
- b) What are the advantages and disadvantages of using hydrogen in SI engines? 6 M
7. a) A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 610⁰ C. The isentropic efficiencies of the compressor and turbine are 80% and 82 % respectively. Determine the power output in kW of an electric generator

geared to the turbine when the air enters the compressor at 15°C and the rate of 16 kg/s .

Take $C_p = 1.005\text{ kJ/kg K}$, $\gamma = 1.4$ for the compression process,

$C_p = 1.1\text{ kJ/kg K}$, $\gamma = 1.33$ for the expansion process. 8 M

- b) Describe with neat sketch the Can type of gas turbine combustion chamber. 6 M
8. a) Derive expressions for the thrust and propulsive efficiency for turbo jet engine. 8 M
- b) What is the importance of specific impulse in rocket performance? What are its units? 6 M