

**GANPAT UNIVERSITY**  
**B.TECH SEM. VII<sup>TH</sup> MECHANICAL ENGINEERING**  
**REGULAR EXAMINATION NOV/DEC. - 2012**  
**ME-705: INTERNAL COMBUSTION ENGINE**

TIME: - 3 HOURS

TOTAL MARKS-70

- INSTRUCTIONS:** (1) All questions are compulsory.  
 (2) Assume suitable data if necessary.  
 (3) Figure to the right indicates full marks.  
 (4) Scientific calculator, steam table is allowed.

**SECTION - I**

- Que.-1 a** An air compressor is being run by the entire output of a supercharged four stroke cycle oil engine. Air enters the compressor at 25°C and is passed on to a cooler where 1210 kJ/min are rejected. The air leaves the cooler at 65°C and 1.75 bar. Part of this air flow is used to supercharge the engine which has a volumetric efficiency of 72% based on induction manifold condition of 65°C and 1.75 bar. The engine which has six cylinders of 100 mm bore and 110 mm stroke runs at 2000 rpm and delivers an output torque of 150 Nm. The mechanical efficiency of engine is 80%. Determine: (i) The indicated mean effective pressure of the engine (ii) The air consumption rate of the engine (iii) The air flow into compressor in kg/min. 08
- b** Explain the thermal characteristics of spark plug with a neat diagram. 04

**OR**

- Que.-1 a** How Miller turbocharging is different from normal turbocharging? 04
- b** What do you understand by ignition timing? Discuss the various factor affect ignition timing requirements. 04
- c** Describe with a neat sketch vacuum spark advance mechanism. 04

- Que.-2 a** Explain the working of Alpha type Stirling engine with a neat sketch. 06
- b** Describe the working principle of Wankel rotary engine with a neat sketch. 05

**OR**

- Que.-2 a** During the trial of a single acting oil engine, cylinder bore 200 mm, stroke length 280 mm, working on two stroke cycle and firing every cycle, the following observations were made:  
 Duration of trial 1 hour, total fuel used 4.22 kg, calorific value is 44670 kJ/kg, proportion of H<sub>2</sub> in fuel 15%, total number of revolutions 21000, indicated mean effective pressure 2.74 bar, net brake load applied to a drum of 1 m diameter is 600 N, total mass of cooling water circulated is 495 kg, Inlet and outlet temperatures of cooling water 13°C and 38°C respectively, Air used is 135 kg, temperature and pressure of air in room is 20°C and 1.0132 bar respectively, temperature of exhaust gases 370°C, mean specific heat of dry exhaust gases 1.005 kJ/kg K, specific heat of steam in exhaust gases 2.3 kJ/kg. 09  
 Calculate the indicated thermal efficiency and draw up a heat balance sheet on kJ/minute basis.
- b** Define pre-ignition and auto-ignition. 02

**Que.-3**

**Attempt Any Three.**

- a Describe high voltage capacitive discharge ignition system with its merits and demerits.
- b What is the effect of the supercharging on the following parameters:  
(i) Power output (ii) Mechanical efficiency (iii) Fuel consumption.
- c Classify Stirling engine in details. Write its merits and demerits over I. C. engine.
- d Explain the effect of various factors on volumetric efficiency.

**SECTION - II**

**Que.-4**

- a What is an emulsion tube? How does it help to control the uniform A.F. ratio with increase in speed to engines? **06**
- b A 6-cylinder 4-stroke C.I. Engine develops 220 kW at 1500 rpm with brake specific fuel consumption of 0.273 kg/kWh. Determine the size of the single hole injector nozzle if the injection pressure is 160 bar and the pressure in the combustion chamber is 40 bar. The period of injection is 30° of crank angle. Specific gravity of fuel = 0.85 and orifice discharge co-efficient=0.9 **06**

**OR**

**Que.-4**

- a Explain the “Ohnesorge diagram”. **06**
- b The diameter of the main jet of a simple carburetor is 0.2 cm & the pressure drop across the venturi is equivalent to 12 cm of water and the co-efficient of discharge is 0.68. Density of petrol is 760kg/m<sup>3</sup>. Find the mass flow rate of fuel into the carburetor. **06**

**Que.-5**

- a Give classification of C.I. engine combustion chambers. Compare induction swirl and compression swirl. **06**
- b Discuss the general principles of S.I. engine combustion chamber design. **05**

**OR**

**Que.-5**

- a Explain knocking in S.I. engine. How do various parameters affect knocking? **06**
- b What is the cause of diesel smoke? Discuss the way by which diesel smoke can be controlled. **05**

**Que.-6**

**Attempt Any Three.**

- a Explain quality and quantity governing in I.C. Engine **12**
- b Give short note on “Stratified charge Engine”.
- c Why the catalytic converter being so popular? Explain 3-way catalytic converter.
- d Discuss different properties of ethanol and methanol and compare them with gasoline.

**END OF PAPER**