Indian Institute of Technology Kharagpur

Mid Semester Examination Time: 2 hours Full Marks: 30

Sub: Internal Combustion Engine, ME60111

Q 1. (a) In any automobile run by an SI engine, the wheels are driven through a gear box which has different gear ratios to change the vehicle speed. 1st gear has ratio - 8; 2nd- 4; 3rd -2 and 4th-1. For a vehicle running at the same speed how are the vehicle speeds different in all four gears? [3]

(b) How should gears be changed for vehicle to run at higher and higher speeds so that engine speed does not very by more than 25%? [1]

Q 2. Given the mep and rpm of all available engines, how will you select an engine for a given output power. [4]

Q3 (a) The combustion in petrol engine is said to be at constant volume and in diesel it is at constant pressure. Can you compare the times of combustion in the two types of engines given that the petrol engine runs at 3000 rpm and diesel at 1000 rpm. The cutoff ratio for diesel is 3 and the compression ratio is 15. [3]

(b) Why are the above combustion times so different? [1]

Q4. (a) What are the instruments will require for the "In-cylinder pressure measurement"? Explain their working principle and the logic behind for the In-cylinder pressure measurement. [4]

(b) There is a multi-cylinder gasoline engine having a carbureted fuel injection system. If you want to convert this into port fuel injection system, then; [6]

(i) What are the hardware you need?

(ii) How you will integrate these hardware with the engine?

(iii) How you will control air-fuel ratios in a close-loop at a given operating condition of the engine?

Q5. (a) Explain why SI engine torque varies, at fixed speed and inlet mixture conditions, as the spark timing is varied from very advanced (e.g., 60^0 before TDC) to close to TDC. What is the "optimum" spark timing? [3]

(b) Describe the sequence of processes which must occur before the liquid fuel in the injection system in direct injection compression engine is fully burned. [2]

(c) What are the fuel spray parameters and how you can measure them? [3]