6. Derive the expression of instant velocity v_p as a function of crank angle θ in a IC engine piston-cylinder.

Derive relation for temperature at start of compression, $T_1 = \frac{rT_a}{r-1+(T_a \mid T_5)}$ if specific heat of reactant and product is same (here T_a and T_5 are initial entry temperature at ambient pressure, and blow down temperature at ambient pressure). '*r*' is compression ratios. Draw the engine processes on P-V diagram. **15**

Unit IV

7. Describe in detail the BOOST software package. Discuss its limitations. **15**

8. Discuss the ANSYS package. How can we generate meshing using ANSYS Software ? **15**

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M. Tech. EXAMINATION, Dec. 2017

(Third Semester)

(Main & Re-appear)

(ME)

MET-623-B

IC ENGINES PROCESS MODELING

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks. Assume suitable values for missing parameters (if any).

Unit I

1. (a) Overview over historical background of diesel engines from 1885 to 1900. **7½**

(b) In a performance test on a four-stroke engine, the indicator diagram area was found to be 5×10^{-4} m^2 and the length of the indicator diagram was 0.05 m. If the *y*-axis has a scale of 1 m = 50 MPa, find the imep of the engine given that bore = 150 mm, stroke = 200 mm, the measured engine speed was 1200 rpm. Also calculate the ip and isfc of the engine if the fuel injected per cycle is 0.5 cc with the specific gravity of 0.08. **7½**

2. Show the energy and availability flows of diesel engine on a P-V diagram.

Air is expanded to perform work in a piston-cylinder assembly. The air is initially at $P_1 = 35$ bar and $T_1 = 2000$ K, and the expansion ratio is 7. The ambient temperature $T_0 = 298$ K and pressure $P_0 = 1$ bar. Determine the useful work that is delivered for an isentropic process. **7½+7½**

Unit II

3. (a) What is surface ignition ? **3**

(b) Define the following terms : **12**

(i) Pre-ignition

(ii) Post-ignition

(iii) Run-on

(iv) Run-away.

4. Enlist and describe the emissions from the diesel engine exhaust. Discuss the soot along with mathematical description for soot formation. **15**

Unit III

5. Define heat of formulation. How will you measure H_{rp} ?

Prove the relation $Q_u = -U_{rp} - 281600\ N_{CO}$. Where N_{CO} designate to number of moles of CO. **15**