

60
[Type text]



**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**MAIN EXAMINATION
2021/2022 ACADEMIC YEAR, SEMESTER ONE**

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN MECHANICAL AND INDUSTRIAL
ENGINEERING (FIFTH YEAR)**

COURSE CODE: MIE 574E

COURSE TITLE: INTERNAL COMBUSTION ENGINES

DATE: 21-04-2022

TIME: 12:00-14:00

INSTRUCTIONS:

- 1. This paper contains FOUR questions**
- 2. QUESTION ONE IS COMPULSORY**
- 3. Attempt any TWO questions from the remaining.**
- 4. Question ONE carries 30 marks and the REST 20 marks each.**
- 5. Examination duration is 2 (TWO) HOURS**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

Determine:

- (i) Stroke length
- (ii) Swept volume
- (iii) Cubic capacity
- (iv) Clearance volume
- (v) Total volume
- (vi) Actual volume of air aspirated per stroke in each cylinder.

QUESTION FOUR (20Marks)

- a) Compare four stroke and two stroke internal combustion engines based on the following: (6 Marks)
- i. Power stroke
 - ii. Fly wheel
 - iii. Initial cost
 - iv. Rate of wear of mechanical parts
 - v. Thermal efficiency
 - vi. Volumetric efficiency
- b) The swept volume of a diesel engine working on a dual cycle is 0.0053m^3 and clearance volume is 0.00035m^3 . The maximum pressure is 65 bar. Fuel injection ends at 5% of the stroke. The temperature and pressure at the start of the compression are 80°C and 0.9 bar. Sketch PV diagram for the cycle and determine the air standard efficiency of the cycle. Take γ for air = 1.4 (14 Marks).

The efficiency of a dual combustion cycle is given by

$$\eta_{\text{dual}} = 1 - \frac{1}{(r)^{\gamma-1}} \left[\frac{\beta \cdot \rho^{\gamma} - 1}{(\beta - 1) + \beta\gamma(\rho - 1)} \right]$$

Where r is the compression ratio; β is the pressure ratio and ρ is the cut-off ratio.