ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE, NIGERIA

DEPARTMENT OF AUTOMOTIVE ENGINEERING

FIRST SEMESTER EXAMINATIONS

2019/2020 ACADEMIC SESSION

HOD'S SIGNATURE

COURSE: **ATE 301** – Internal Combustion Engines (3 Units)

CLASS: 300 Level Automotive Engineering

TIME ALLOWED: 3 Hours

INSTRUCTIONS: Answer any **FIVE** questions

Date: February, 2020

Question 1.

(a). List the pollutants from exhaust of an internal combustion engines.

(b). Discuss the characteristics and mechanism of the formation of the following emissions from the flue gases of internal combustion engines: Carbon monoxide; Oxide of Nitrogen; and Aldehyde.

Question 2.

(a). Sketch the ideal air standard dual cycle labelling all salient parts.

(b). The pressure ratio of a dual standard ideal air engine is 9 while the cutoff ratio is 1.5. For a volume compression ratio of 3, determine the efficiency of this engine, if the specific heat at constant pressure is 1.2 kJ/kg.K and specific heat at constant volume is 0.62 kJ/kgK.

(c). Suppose the volume at the maximum compression stage of the engine in (b) above is 3.5 m^3 while the volume at the beginning of expansion stroke is 6 m^3, determine the load ratio of the cycle.

Question 3.

(a). Sketch the ideal air standard diesel engine cycle and discuss the stages there-in.

(b). The heat released during the combustion of a charge in the combustion chamber of a diesel engine is 35 kW while the temperature of the flue exhaust was 40 °C. The ambient air temperature is 25 °C and the charge specific heat at constant volume is 0.71 kJ/kgK. If the mass flow rate of the charge is 1 Unit, determine the exhaust heat and the efficiency of the cycle.

Question 4.

(a) List the types of equipment available for the determination of the break power of an automotive engine.

(b) Discuss how you may employ at least two of the equipment in (a) above to determine the break power of an automotive engine.

Question 5.

To determine the air consumption during engine operation, an air box may be used. With a sketch, discuss how you as an automotive engineer will carry out the measurement of the mass of air consumed in an automobile engine.

Question 6.

Discuss all the factors, that you know as an automotive engineer, affecting normal combustion in spark ignition engine and their possible control. (Show diagram where necessary).

Question 7.

(a) Sketch the diagram of Pressure-Crank Angle Diagram of a petrol engine and label all the salient parts.

(b) Discuss the spread of flame, in internal combustion engine, employing the diagram in (a) above.