

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
DEPARTMENT OF MECHANICAL ENGINEERING
2018/2019 HARMATTAN SEMESTER EXAMINATION
COURSE: ATE 501 AUTOMOTIVE TECHNOLOGY II

INSTRUCTIONS: ANSWER 5 QUESTIONS;

TIME ALLWED; 3 HOURS

QUESTION 1

- a Highlight the operational requirements of engine crankshaft how they are met
- b State the factors that determine the strength of engine crankshaft
- c Sketch the crank throw arrangement of 4-cylinder, 6-cylinder and V-8 cylinder engines

QUESTION 2

- a Describe the enbloc design of engine block and its advantages. Give the factors that influence the design of engine blocks.
- b Explain 3 methods of controlling piston expansion.
- c What are the functions and forces engine piston are designed to withstand.

QUESTION 3

- a Highlight the SAE classifications of lubricating oils and their applications.
- b Describe briefly the hydrodynamic lubrication and the factors that promote it
- c Explain the purpose and mechanism of the following lubing oil additives
(i) Dispersant (ii) Detergent (iii) Oxidation inhibitor (iv) Pour point depressant (v) Foam inhibitor.

QUESTION 4

- a Highlight the important noise components of internal combustion engines and their sources and illustrate graphically how they vary with engine speed
- b Explain the sources of the engine pollutants and how they vary with Air/Fuel ratio
- c State the required properties of engine bearing materials

QUESTION 5

- a State, (i) 3 causes of valve head failure (ii) 3 advantages of poppet valves
- b Draw the heat path of poppet valve and explain the methods of cooling exhaust valves
- c Outline the design considerations for the connecting rod big end

QUESTION 6

- a Explain the pressurized cooling system and state its advantages
- b Describe the reverse loop scavenging system
- c State the reasons why the petrol fuel injection system is replacing the carburetor system in modern internal combustion engines