



# TECHNICAL UNIVERSITY OF MOMBASA

## FACULTY OF ENGINEERING AND TECHNOLOGY

### DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

#### UNIVERSITY EXAMINATION FOR:

#### BSC IN MECHANICAL ENGINEERING

#### EMG 2522 : VEHICLE SYSTEM ENGINEERING

#### END OF SEMESTER EXAMINATION

**SERIES:** APRIL 2016

**TIME:** 2 HOURS

**DATE:** Pick Date Select Month Pick Year

#### **Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Attempt any **THREE** questions.

**Do not write on the question paper.**

#### **Question ONE**

- a.) Discuss the advantages and disadvantages of having a front mounted engine and a rear wheel drive (10marks)
- b.) There are two types of steering gear mechanism is the Davis steering and Ackermann steering gear. Explain the main features and show their differences (6marks)
- c.) Interpret the following information on a tyre marking 175/65 R 14 82H (5marks)
- d.) Discuss the differences between cross ply and radial ply tyres. (4 marks)

#### **Question TWO**

- a.) Explain the following classes of light vehicles
- i.) Saloon car
- ii.) Coupe
- iii.) Convertible

- iv.) Estate car
- v.) Pick up (10marks)
- b.) Explain the following
  - i.) stopping distance
  - ii.) Braking efficiency (4 marks)
- c.) Explain the factors that determine stopping distance (4 marks)
- d.) What is the difference between a torsion bar and stabilizer bar (2 marks)
- e.) Brief discuss the process of painting a motor vehicle body after a an accident, clearly identify tools and materials involved (5 marks)

### **Question THREE**

- a.) Explain the various functions of the chassis frame (5 marks)
- b.) Mention any three type of chassis frame sections use illustration (3 marks)
- c.) Explain the meaning of wheel alignment and explain factors affecting it (6 marks)
- d.) Explain the need to use flexible mounting for the engine (4 marks)
- e.) Distinguish between resonance and transmissivity (2 marks)
- f.) An engine oscillates vertically on its flexible rubber mounting with a frequency of f 950 vibrations per minute
  - i.) Determine natural frequency of vibration when static deflection of engine is 3 mm and
  - ii.) Find disturbing to natural frequency ratio
  - [iii] If disturbing to natural frequency of vibration and new static deflection(5 marks)

### **Question FOUR**

- a.) Explain the following
  - i.) Under steering
  - ii.) Over steering
  - iii.) Turning radius
  - iv.) Slip angle(4 marks)

b.) i.) Explain the functions of the steering system in a vehicle (6 marks)

ii) Which the aid of a diagram, identify the main components of the steering system (10marks)

c.) If due braking, 200g or rubber tread is removed from the tyre, 300 mm from the center of rotation. Determine when wheel has reached a speed of 180 km/hr, the following

i.) Angular speed of wheel in RPM

ii.) Centrifugal force

Commend on vehicle stability as a result of this (5 mark)

### **Question FIVE**

**a.)** Define the following

i.) Steering geometry

ii.) Caster angle

iii.) Camber angle

iv.) Kingpin inclination

v.) Toe out

vi.) Toe in (6 marks)

b.) What are the requirements of bodies for various types of vehicles (5 marks)

c.) Explain the following suspension movements in a vehicle.

i.) Bouncing

ii.) Pitching

iii.) Rolling (3 marks)

d.) Explain the need for shock absorbers and state two types of shock absorber (3 marks)

e.) Explain the meaning of wheel aligning (2 marks)

f.) A car of mass 950kg is travelling at 80 km/predetermine

i.) Kinetic energy it possesses

iii.) Average braking force to bring the rest in 30m

iii.) Minimum braking distance

iv.) Braking efficiency, if braking distance is 60 m (6 marks)