UNIVERSITI KUALA LUMPUR
KAMPUS CAWANGAN MALAYSIAN SPANISH INSTITUTE

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	SCB24703 (V1)
COURSE TITLE	:	CHASSIS AND VEHICLE DYNAMICS
PROGRAMME NAME	:	BACHELOR OF ENGINEERING TECHNOLOGY (HONS) IN MECHANICAL (AUTOMOTIVE)
DATE	:	30 JANUARY 2026
TIME	:	3:00PM - 6:00PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Answer ALL questions for Section A.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. ☐ *Tick if applicable*
9. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 7 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

Question 1

You are tasked with designing a suspension system for a new sports car that must provide excellent handling and stability during high-speed cornering while maintaining a comfortable ride for everyday driving. The car will be used primarily on smooth, high-performance roads but must also be capable of handling occasional rough road conditions.

(a) Design a suspension system for this sports car, taking into account the need for high-speed stability and ride comfort. Choose the type of suspension components (springs, dampers, linkages) you would use, and why?

(6 marks)

(b) Assess how suspension geometry (caster, camber, and toe angles) affects the handling and performance of the sports car, and suggest the optimal adjustments for high-speed cornering.

(6 marks)

(c) Interpret the trade-offs between comfort and handling in the suspension system design, and suggest how you would balance both factors for this sports car.

(8 marks)

Question 2

A car manufacturer is designing a new model of electric vehicle (EV). As an automotive engineer, your task is to design the chassis frame for a new EV aimed at maximizing safety, reducing weight for better efficiency, and ensuring structural integrity under heavy loads. The chassis should also be capable of withstanding crash impacts while accommodating battery packs, electric motors, and other components.

(a) Apply your understanding of chassis frame design and select the most appropriate material for the chassis, justifying your choice based on the vehicle's performance and safety requirements.

(6 marks)

(b) Examine how the design of the frame can influence the overall vehicle weight and performance, and how weight reduction strategies can be implemented without sacrificing safety.

(8 marks)

(c) Show how different frame types (ladder, monocoque, and space frame) might affect the structural rigidity and performance of the EV, and propose the most suitable frame type for this application.

(6 marks)

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Analyzing a high-performance sports car's braking system is your job as an engineer. The vehicle must be capable of achieving rapid deceleration while ensuring driver safety and vehicle stability during emergency braking at high speeds.

(a) Analyze how the interaction between the brake pads, rotors, and hydraulic system contributes to the overall braking efficiency of the sports car, considering factors such as heat generation and fluid pressure.

(6 marks)

(b) Investigate the effects of brake fade on the performance of the braking system during repeated high-speed deceleration, and propose methods to mitigate this issue.

(6 marks)

(c) Examine the role of electronic control systems (such as ABS or EBD) in optimizing braking performance and stability, especially under emergency conditions.

(8 marks)

Question 2

A delivery vans used for urban deliveries is experiencing uneven tire wear. The vehicles are frequently loaded and driven through urban areas with frequent stop-and-go driving, tight turns, and short distances. The manager is seeking advice on why the tires are wearing out prematurely.

(a) Investigate how urban driving conditions, such as frequent stop-and-go traffic and tight turns, affect tire wear.

(6 marks)

(b) Classify the different types of tire wear patterns and analyze which type is most likely to occur under the driving conditions described.

(8 marks)

(c) Examine how improper tire inflation might contribute to premature wear and propose a maintenance solution to prevent it.

(6 marks)

Question 3

A high-performance sports car equipped with a rack and pinion steering system experiences steering vibrations at high speeds, especially during sharp turns. The vibrations are most noticeable at the steering wheel, causing discomfort and distracting the driver.

(a) Investigate the factors that could cause steering vibration at high speeds, particularly during sharp turns.

(6 marks)

(b) Classify the potential causes of steering vibrations into mechanical, dynamic, and electrical categories and analyze how each category impacts performance.

(6 marks)

(c) Compare the solutions for reducing steering vibrations through suspension system adjustments versus modifications to the steering system itself.

(8 marks)

Question 4

An off-road vehicle is experiencing handling issues, particularly during off-road trails with rough terrain. The steering feels unresponsive, and there's noticeable uneven tire wear. The issue seems related to wheel misalignment, but the vehicle has just had an alignment service.

(a) Investigate how off-road driving affects tire and wheel alignment and contributes to handling problems.

(6 marks)

(b) Classify the types of wheel misalignment and analyze which type would most likely contribute to the handling issues in this off-road vehicle.

(8 marks)

(c) Examine how off-road tires and wheels should be designed or adjusted to better withstand rough conditions and improve alignment stability.

(6 marks)

END OF EXAMINATION PAPER