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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME : VEHICLE SUB-SYSTEM
TECHNOLOGY

COURSE CODE : BNG 31003

PROGRAMME CODE : BNG

EXAMINATION DATE : JULY / AUGUST 2023

DURATION : 3 HOURS

INSTRUCTIONS

1. ANSWER **ALL** QUESTIONS
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**.
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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- Q1** (a) Internal combustion engine has been used to power road-vehicle since the second industrial revolution. As the technology improves, various types of fuel are offer to be used on this engine. List the **FIVE (5)** types of fuel that available in market. (5 marks)
- (b) A force induction system is used to increase air density that enters the engine cylinder. This system can increase mean effective pressure and brake thermal efficiency of the engine. Describe **FIVE (5)** comparisons of supercharger and turbocharger. (10 marks)
- (c) Internal combustion engine is a type of heat generator. The accumulated heat inside the engine can cause overheating and lead to major engine damage. Therefore, cooling system is crucial to avoid this incident. Illustrate a diagram and label important components of liquid cooling system for internal combustion engine. Also determine the hot and cooled liquid flow in the system. (10 marks)
- Q2** (a) Nowadays, most vehicles use Continuous Variable Transmission (CVT) in their drivetrain. Determine **FOUR (4)** advantages of CVT compared to the conventional automatic transmission. (4 marks)
- (b) Differential is a set of gear located at the end of drivetrain.
- (i) Explain the function of differential. (2 marks)
- (ii) Explain the function of Limited Slip Differential (LSD)? (2 marks)
- (iii) What is the additional component in the LSD which is not available in the conventional differential? (1 mark)
- (c) A modern passenger vehicle commonly using a unitary construction frame for the chassis. With the aid of diagram, show the location of A pillar, B pillar, C pillar, Rocker Panel, and Quarter Panel on the unitary construction frame for sedan. (5 marks)
- (d) Vehicle is a moving machine that carrying or transporting something. Therefore, its chassis should be properly designed to meet the needs of its purposes. Determine **FIVE (5)** requirements to achieve an ideal chassis design. (5 marks)
- (e) Supercar is a high-performance sports car and designed to go as fast as possible. It has an aerodynamic design with lightweight materials which make it is very expensive. Choose **TWO (2)** material used to construct a supercar chassis. Also states the sub-component made by these materials and its joint method to make a chassis. (6 marks)

- Q3 (a) Figure Q3 (a)** shows two different types of front suspension.
- (i) Identify component A, B, C, D, E, F, and the name of suspension system for G and H. (4 marks)
 - (ii) In your opinion, which suspension provides better traction during cornering? (1 mark)
 - (iii) Justify your answer in **Q3(a)(ii)**. (3 marks)
- (b) Steering system converts rotary movement of steering wheel into angular turn of the road wheel. Determine **THREE (3)** qualities should be have for a steering system. (3 marks)
- (c) Wheel alignment relates to the relative position of the wheels for obtaining a true and free rolling movement over the road. With the aid of diagram, illustrate the definition of camber, caster, toe-in, and toe-out. (4 marks)
- (d) Hydraulic power steering has been dominant for over 50 years before Electric Power Steering (EPS) has become the norm for most cars. Classify **FIVE (5)** features of hydraulic power steering and EPS. (10 marks)
- Q4 (a) Figure Q4 (a)** shows a tyre manufactured by Unitech Rubber. Gather **SEVEN (7)** information from the tyre side wall. (7 marks)
- (b) **Figure Q4 (b)** shows the wear pattern of tyre which A is centre rib wear, B is outer rib wear, C is side wear, and D is cupped wear. From your observation, analyse the causes of these problems? (4 marks)
- (c) Brake failure is a common problem on a heavy-load vehicle, as example shown in **Figure Q4 (c)**. This vehicle uses a drum brake with pneumatic braking system which potentially fails when the supply pressure of the compressed air drops.
- (i) Justify, why do heavy-load vehicle use drum brake for all the wheels? (4 marks)
 - (ii) Justify, why this system is still relevant for this vehicle? (5 marks)
- (d) **Figure Q4 (d)** shows a track of tyre mark for Car A and Car B on a road surface during emergency braking to avoid a cute kitten. Investigate the brake system used by the Car A and explain why it left a broken line on the road surface. (5 marks)

-END OF QUESTIONS-

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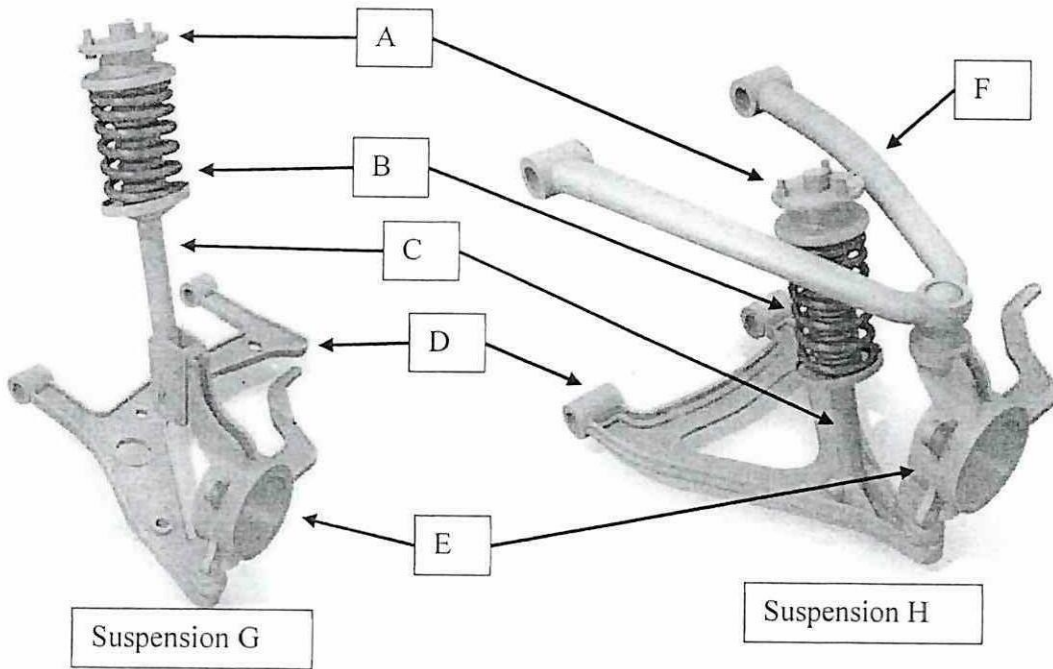


Figure Q3 (a)

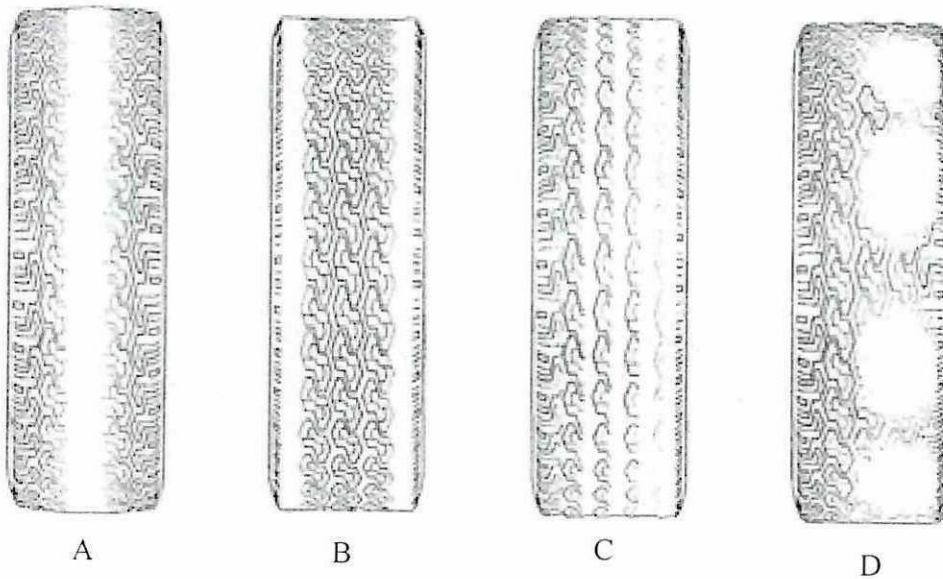


Figure Q4 (a)

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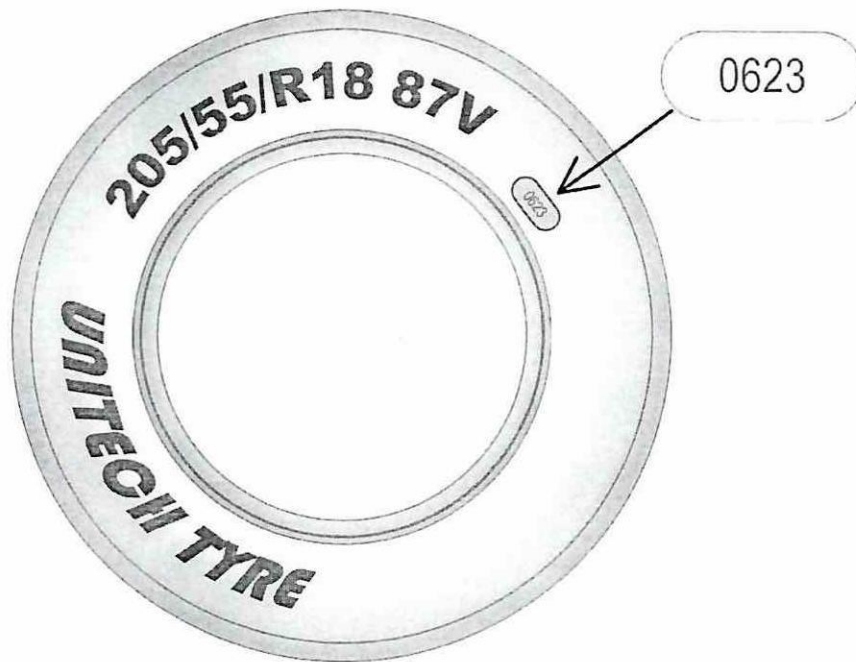


Figure Q4 (b)

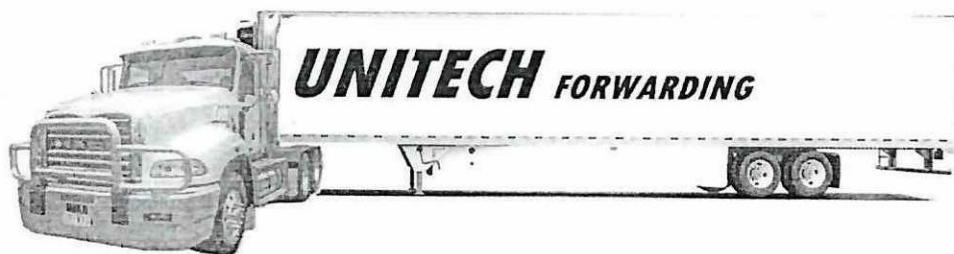


Figure Q4 (c)

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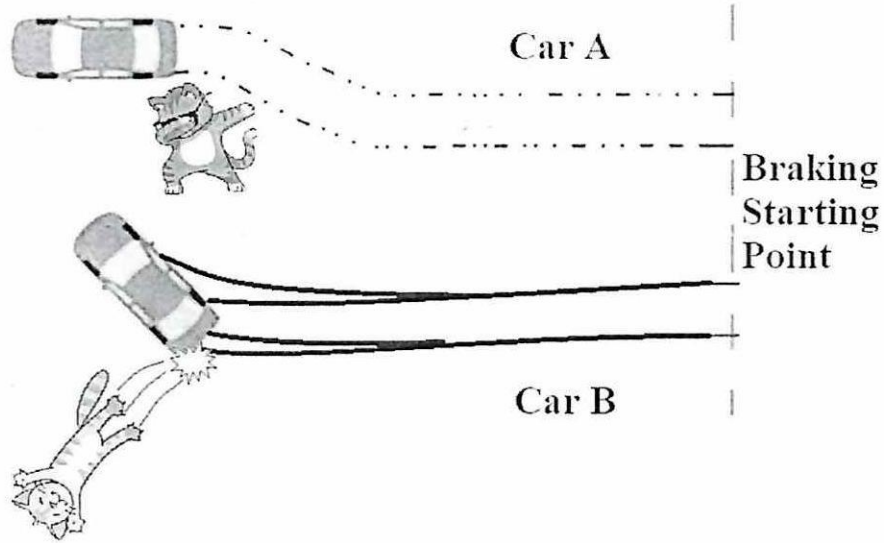


Figure Q4 (d)

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