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Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2021/2022**

COURSE NAME : ROLLING STOCK AND TRACTION SYSTEMS

COURSE CODE : CNR 10403

PROGRAMME CODE : CNR

EXAMINATION DATE : JANUARY/FEBRUARY 2022

DURATION : 3 HOURS

INSTRUCTION : 1. ANSWER ALL QUESTIONS.  
2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK**.

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

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- Q1 (a)** Rolling stock is referred as vehicle that uses railways as mode of transportation. There are many types of rolling stock in railways. Discuss **FOUR (4)** types of rolling stock that available at present railways operation.  
(4 marks)
- (b)** In metro systems, automation refers to the process by which responsibility for operation management of the trains is transferred from the driver to the train control system. There are **FOUR (4)** types of Grade of Automation (GoA) particularly on Automatic Train Operation (ATO). Discuss briefly and relate your discussion incorporated with Malaysia's railway operation.  
(16 marks)
- (c)** With aid of an appropriate diagram, explain **FIVE (5)** main components of a rolling stocks.  
(5 marks)
- Q2 (a)** Explain briefly **FIVE (5)** differences of motor bogies and non-motor bogies components and functions.  
(10 marks)
- (b)** There are six degrees of freedom of a vehicle motion. Therefore:
- (i)** With aid of diagrams, investigate those motions associated with railways vehicles during operation.  
(5 marks)
- (ii)** Justify your analysis on those motions associated with railways vehicles during operation.  
(10 marks)
- Q3 (a)** Rail steel grades are normally categorized by the head hardness where in most cases the grade naming designation contains the minimum hardness value Brinell hardness. Propose the term of a hardness material means.  
(6 marks)
- (b)** Composite are produced when two or more materials or phases are used together to give combination properties. Compare the advantages and disadvantages of composite for the car body.  
(4 marks)
- (c)** Design the contacts for a switch or relay that opens and closes a high-current electrical circuit.  
(10 marks)
- (d)** Discuss briefly the forming operations in the materials process. Sketch **ONE (1)** of forming operations.  
(5 marks)

- Q4 (a)** High-Speed Rail (HSR) systems have a proven record of efficient services in about a dozen countries. Recently, Magnetic Levitation (Maglev) technology for High-Speed Ground Transportation (HSGT) has been proposed for many intercity and regional lines in Germany, Japan, the United States, and other countries. Maglev developers claim that their system can achieve higher speeds, have lower energy consumption and life cycle costs, attract more passengers, and produce less noise and vibration than high-speed rail. Analyse **THREE (3)** most important system characteristics why recent developments of HSR have reduced the advantage of Maglev. (3 marks)
- (b)** The traction system is a component of the train. It is a system installed on the roof or underneath the train. The traction system converts the electrical energy, collected from the catenary via the pantograph, into mechanical energy, thus enabling the wheels to turn and, therefore, the train to accelerate and brake.
- (i)** Distinguish between AC and DC traction systems in term of operation, the voltage used and the average distance between two substations. (8 marks)
- (ii)** From **Q4(b)(i)** figure out the advantages and disadvantages of AC and DC traction systems. (4 marks)
- (c) (i)** Discuss why regenerative braking is not possible in DC Series motor. Construct the suitable circuit in applying regenerative braking in DC series motor and the procedure to overcome it. (8 marks)
- (ii)** Figure out the **TWO (2)** main motivations to employ regenerative braking. (2 marks)

**-END OF QUESTIONS -**