Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	ANTENNA THEORY AND APPLICATIONS
COURSE CODE	:	BEJ 41603
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**. 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIOR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Describe the function of antennas in details.

(3 marks)

(b) Explain with the aid of diagram or illustrations each of the antenna's characteristics as stated below in details:

(i) Return Loss and Reflection Coefficient Magnitude.

(5 marks)

(ii) Polarization.

(3 marks)

(iii) Bandwidth.

(3 marks)

(iv) Beamwidth.

(2 marks)

(c) Describe your action on the scenarios as the following:

(i) how to make antenna more directional?

(3 marks)

(ii) what is the form of the radiated wave in near-field region?

(3 marks)

(iii) how the energy radiated from an isotropic radiator?

(3 marks)

Q2 (a) Differentiate between wire-type and aperture-type antennas.

(5 marks)

(b) A Yagi-Uda antenna is the antenna that famously employed in television receivers. As an antenna engineer, you have been asked to design an Ultra High Frequency (UHF) Yagi-Uda antenna.

:

(i) Determine the detail specifications of the antenna (You must include the suitable diagrams, illustrations, and calculations in your answer).

(12 marks)

(ii) State three (3) advantages of such antennas.

(3 marks)

(c) If the antenna in Q2(b) is now designed for Wi-Fi @5GHz with the gain of 6 dBi and transmit power of 1mW, determine the amplitude of electric field at distance 10 m.

(5 marks)

Q3 (a) Patch antenna is one of a resonant antenna that widely used in many applications, which operate efficiently over relatively narrow frequency band. Prioritize the method of designing patch antenna for Wi-Fi application. You must include the specifications, design, sketch, and illustrations in your answer.

(7 marks)

(b) Antenna measurement is also important to verify the design that has been stated in Q3(a). One of the measurements is antenna radiation pattern measurement.

(i) Sketch the radiation pattern of patch antenna.

(3 marks)

(ii) Differentiate between the *E-plane* and *H-plane* of the antenna with appropriate illustrations.

(6 marks)

(iii) Explain how the two planes in Q3(b)(ii) are measured.

(9 marks)

Q4 (a) In 5G mobile communications, higher gain antennas are very essential and required in the system. As a telco-engineer that has been responsible for 5G antenna design,

(i) show in detail how this specification can be achieved.

(6 marks)

(ii) identify the frequency spectrum that is used in 5G.

(3 marks)

(iii) propose and sketch the suitable antenna for your design and explain it in detail.

(10 marks)

(iv) state some limitation in your design.

(3 marks)

(b) Outline the advantages of 5G Mobile Communications system.

(3 marks)

-END OF QUESTIONS-