

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 5

LEFEL 5

EXAMINATION PERIOD
JANUARY 2016

CYFNOD ARHOLIADAU
IONAWR 2016

MODULE CODE: M5X01045
Wireless Networks

TIME: 2 HOURS

ANSWER THREE QUESTION OUT OF FOUR

Equipment or materials required – Basic Calculator

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ANSWER THREE QUESTIONS

1. First Exam Question

With reference to IEEE 802.11 logical architecture explain:

- a. The logical link control (LLC) to the upper-layer protocol (ULP)
 - i. Unacknowledged connectionless services
 - ii. Acknowledged connection-oriented services
 - iii. Acknowledged connectionless services

(9 marks)
- b. Any **seven** of the following LLC services to media access control (MAC) layer:
 - i. Authentication
 - ii. Deauthentication
 - iii. Privacy
 - iv. MSDU delivery
 - v. Association
 - vi. Disassociation
 - vii. Distribution
 - viii. Integration
 - ix. Reassociation

(7 marks)
- c. MAC sublayer services:
 - i. Asynchronous data services
 - ii. Security services
 - iii. MSDU ordering

(9 marks)

2. Second Exam Question

- a. Describe the two main types of antenna. Use examples and diagrams as part of your explanations.

(12 marks)
- b. For a Parabolic reflective antenna with diameter of 2m, operating at 10GHz. Calculate the following: (include all calculation steps)
 - i. Effective area

(2 marks)
 - ii. The antenna gain

(5 marks)
 - iii. If the wavelength is 3mm, what is the antenna gain for:
 - 1.Parabolic antenna

(3 marks)
 - 2.Horn antenna

(3 marks)

Note 1: The relationship between antenna gain and effective area is:

$$G = \frac{4\pi A_e}{\lambda^2} = \frac{4\pi f^2 A_e}{c^2}$$

Where

G = antenna gain

A_e = effective area

f = carrier frequency

c = speed of light ($\approx 3 \times 10^8$ m/s)

λ = carrier wavelength

Note 2: Table 1 in relation to antenna gain and effective area

Type of Antenna	Effective Area A_e (m ²)	Power Gain (relative to isotropic)
Isotropic	$\lambda^2/4\pi$	1
Infinitesimal dipole or loop	$1.5\lambda^2/4\pi$	1.5
Half-wave dipole	$1.64\lambda^2/4\pi$	1.64
Horn, mouth area A	$0.81A$	$10A/\lambda^2$
Parabolic, face area A	$0.56A$	$7A/\lambda^2$
Turnstile (two crossed, perpendicular dipoles)	$1.15\lambda^2/4\pi$	1.15

3. Third Exam Question

- a. The technique used for multiple accesses to the shared medium in WLANs is CSMA/CA. Describe the process of this technique. Use diagram as part of your descriptions.

(10 marks)

- b. Explain the following terms:

- Refraction
- Reflection
- Bandwidth

(15 marks)

4. Fourth Exam Question

- a. An Internet Provider based in Swansea is looking to improve its wireless broadband services to cover the entire Swansea area using WiMax or WLAN. From your knowledge about these two technologies (WiMAX and WLAN) provide the Internet provider with a comparative report for these technologies. You should include services supported, data rates, security concerns, coverage area, cost, advantages and disadvantages.

(20 marks)

- b. Explain the following threats to wireless networks:

- Reconnaissance attack
- Denial-of-service attacks

(5 marks)

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