



PRIFYSGOL CYMRU
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UNIVERSITY OF WALES
Trinity Saint David

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 5

LEFEL 5

**EXAMINATION PERIOD
JANUARY 2015**

**CYFNOD ARHOLIADAU
IONAWR 2015**

MODULE CODE: M2X8524, M2X8633, M5X8937
Wireless Networks and Protocol Design

TIME: 2 HOURS

**ANSWER THREE QUESTIONS OUT OF FOUR. EACH QUESTION
CARRIES EQUAL MARKS.**

Equipment or materials required – Basic Calculator

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ANSWER THREE QUESTIONS

1. First Exam Question

Apply your understanding about wired and wireless networks

- a. Draw a labelled topology that incorporates both networks (15 marks)
- b. Compare and contrast wired and wireless LANs (5 marks)
- c. What unique concerns must be addressed by the designer of a wireless LAN? (5 marks)

2. Second Exam Question

- a. Antenna is an important part of wireless networks, critically evaluate this statement. (12 marks)
- b. For a Parabolic reflective antenna with diameter of 2m, operating at 12GHz. Calculate the following: (include all calculation steps)
 - i. Effective area (2 marks)
 - ii. The antenna gain (5 marks)
 - iii. If the wavelength is 30cm, 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. With reference to IEEE 802.11 logical topologies explain the following terms (use diagrams as part of your explanations)
 - i. Basic service set (BSS)
 - ii. Independent basic service set (IBSS)
 - iii. Extended service set (ESS)
 - iv. Distribution system (DS)
 - v. Roaming

(20 marks)
- b. Explain the differences between the two primary standards:
 - i. Public standard
 - ii. Official standard

(5 marks)

4. Fourth Exam Question

- a. An ISP based in Swansea is organising an awareness campaign for its customers to allow them to understand the importance of encrypting their wireless communications. Evaluate the concept of the three listed security scheme for the ISP, recommend and justify the preferred choice for the ISP customers' wireless devices. (you may use diagram as part of your explanations):
 - i. WEP
 - ii. TKIP (WPA)
 - iii. CCMP (WPA2)

(20 marks)
- b. Explain the following threats to wireless networks:
 - i. Ad hoc networks
 - ii. Rouge APs

(5 marks)