

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 5

LEFEL 5

**EXAMINATION PERIOD
JANUARY 2017**

**CYFNOD ARHOLIADAU
IONAWR 2017**

**MODULE CODE: M5X01060
Wireless Networks**

TIME: 2 HOURS (USE 1 ½ NOT 1.5 FOR TIME)

ANSWER ALL QUESTIONS

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

Equipment or materials required – Basic Calculator

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ANSWER THREE QUESTIONS

Q1.

- a. Temporal Key Integrity Protocol (TKIP/WPA) is the second security scheme developed by IEEE 802.11. Explain TKIP shown in figure 1

(10 Marks)

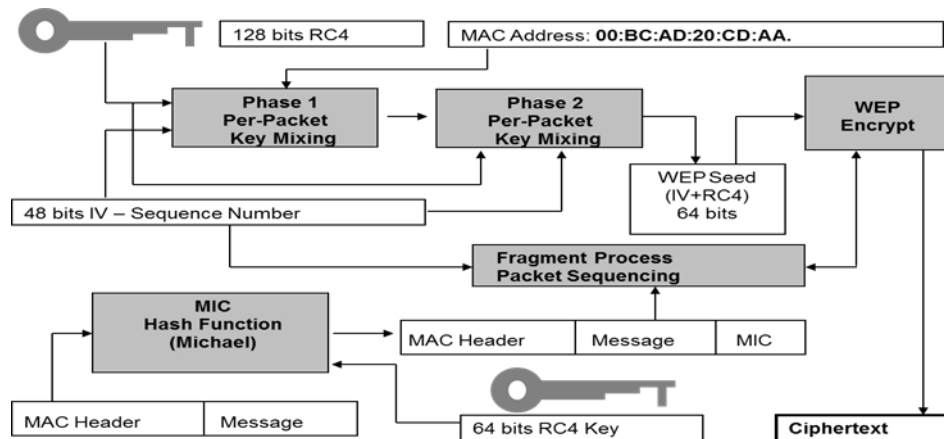


Figure 1: TKIP/WPA security scheme

- b. Complete the IEEE 802.11 security scheme table below.

(12 Marks)

Protocol Feature	WEP	WPA (TKIP)	WPA2 (CCMP)
Access Control and Key Management Framework			802.1X Framework
Encryption Algorithm	RC4		
Key Size		128 or 256 bits	
Key Protection		48 bits IV	
Data Confidentiality			128 bits
Data Authenticity and Integrity			CBC-MAC 128ts

- c. Name at least three types of attacks and detection methods

(3 Marks)

Q2.

- a. With the aid of appropriate diagrams explain the following:
 - i. Line-of-sight propagation **(6 Marks)**
 - ii. Sky-wave propagation **(6 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

Q3.

- a. What are the two distinct part of wireless ATM and what are their responsibilities? **(10 marks)**
- b. A newly formed company wants to set up its computer network and ask you to provide information on WLAN and LAN. Explain the difference between WLAN and LAN to the company. **(15 marks)**

Q4.

- a. Name the two sub-layers of the Data Link defined by IEEE 802.11 and give their purposes.
(10 Marks)
- b. In reference to IEEE 802.11 logical architecture, topologies and physical layer, match each word number to the appropriate definition or term.
(15 Marks)

Words	Definition / Terms	Answers
1. Basic Service Set (BSS)	Provide the services necessary to handle address to destination mapping and seamless integration of multiple BSSs.	
2. Authentication	This system defines the characteristics and methods of transmitting and receiving data through a wireless medium between two or more STAs, each using the same PHY system.	
3. Distribute System (DS)	Enables the delivery of MAC frames through a portal between a distribution system and a non-802.11 LAN	
4. Privacy	This is when a random back-off procedure is used to resolve medium contention conflicts	
5. Extended Service Set (ESS)	Prevents message contents from being read by unintended recipient	
6. Distribution	What is the fundamental access method of the IEEE 802.11 MAC, carrier sense multiple access with collision avoidance (CSMA/CA), called?	
7. Physical Medium-dependent (PMD) System	The process or ability of a wireless client to move from one cell or BSS to another without losing connectivity to the network.	
8. MSDU ordering	The services provided by the MAC sublayer permit, and may require, the reordering of MSDUs.	
9. Integration	Establishes initial association between station and AP	
10. Carrier sense multiple access with collision avoidance (CSMA/CA)	The services provided by the MAC sublayer permit, and may require, the reordering of MSDUs.	
11. Distributed Coordination Function	In this mode of operation, IEEE 802.11 stations communicate directly. It is often referred as an Ad-hoc network.	
12. Roaming	Logical Link Control and the Media Access Control made up which layer?	
13. Asynchronous data services	All stations communicate by way of the AP, and do not communicate directly.	
14. Independent BSS (IBSS)	The primary service used by stations to exchange MAC frames when the frame must traverse the DS to get from a station in one BSS to a station in another BSS	
15. Data Link Layer	Establishes identity of stations to each other	

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