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**Semester One 2016
Examination Period**

Faculty of Information Technology

EXAM CODES: FIT5187

TITLE OF PAPER: Wireless Networks - PAPER 1 of 1

EXAM DURATION: 3 hours writing time

READING TIME: 10 minutes

THIS PAPER IS FOR STUDENTS STUDYING AT: (tick where applicable)

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|------------------------------------|---|------------------------------------|--|--|
| <input type="checkbox"/> Berwick | <input type="checkbox"/> Clayton | <input type="checkbox"/> Malaysia | <input type="checkbox"/> Off Campus Learning | <input type="checkbox"/> Open Learning |
| <input type="checkbox"/> Caulfield | <input type="checkbox"/> Gippsland | <input type="checkbox"/> Peninsula | <input type="checkbox"/> Monash Extension | <input type="checkbox"/> Sth Africa |
| <input type="checkbox"/> Parkville | <input checked="" type="checkbox"/> Suzhou, China | | | |

During an exam, you must not have in your possession any item/material that has not been authorised for your exam. This includes books, notes, paper, electronic device/s, mobile phone, smart watch/device, calculator, pencil case, or writing on any part of your body. Any authorised items are listed below. Items/materials on your desk, chair, in your clothing or otherwise on your person will be deemed to be in your possession.

No examination materials are to be removed from the room. This includes retaining, copying, memorising or noting down content of exam material for personal use or to share with any other person by any means following your exam.

Failure to comply with the above instructions, or attempting to cheat or cheating in an exam is a discipline offence under Part 7 of the Monash University (Council) Regulations.

AUTHORISED MATERIALS

OPEN BOOK ☐ YES ☒ NO

CALCULATORS ☒ YES ☐ NO

SPECIFICALLY PERMITTED ITEMS ☐ YES ☒ NO

if yes, items permitted are:

Candidates must complete this section if required to write answers within this paper

STUDENT ID: _ _ _ _ _

DESK NUMBER: _ _ _ _ _

IMPORTANT - Instruction to all students taking this examination

- 1) There are two parts in this examination consisting of 8 pages (inclusive of front coversheet).**
- 2) Part A has six questions (question 1 to 6) on the fundamental concepts of wireless networks. Answer only five out of six questions, total possible score of this part is 50 marks.**
- 3) Part B has also six questions (question 7 to 12) on the current and emerging technology of wireless networks. Answer only five out of six questions, total possible score of this part is 50 marks.**
- 4) Answer each question in a new page in the examination script book. Answers not in the script book will not be counted. Please note that only the first five questions' answers for each part will be graded.**
- 5) Total possible score of this examination is 100 marks. Monash University's latest FIT policy on examination results applies in FIT5187 Wireless Networks.**

PART A (Answer any 5 out of 6 questions)

Question 1. (5x2 marks = 10 marks)

Explain briefly the following phenomena related to electromagnetic wave propagation:

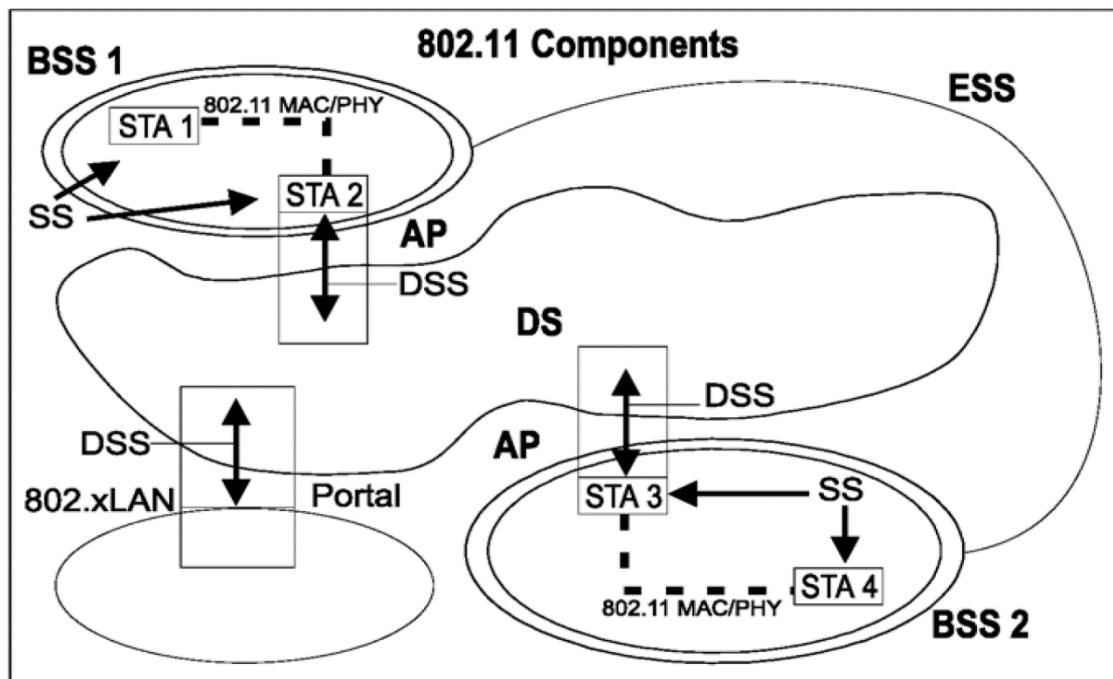
- Reflection
- Refraction
- Diffraction
- Absorption
- Scattering

Question 2. (10 marks)

Describe the **components** and their **functions** of the following 802.11 network.

Itemise your description using the following format:

- BSS is ... and its function is to ...



Question 3. (5x2 marks =10 marks)

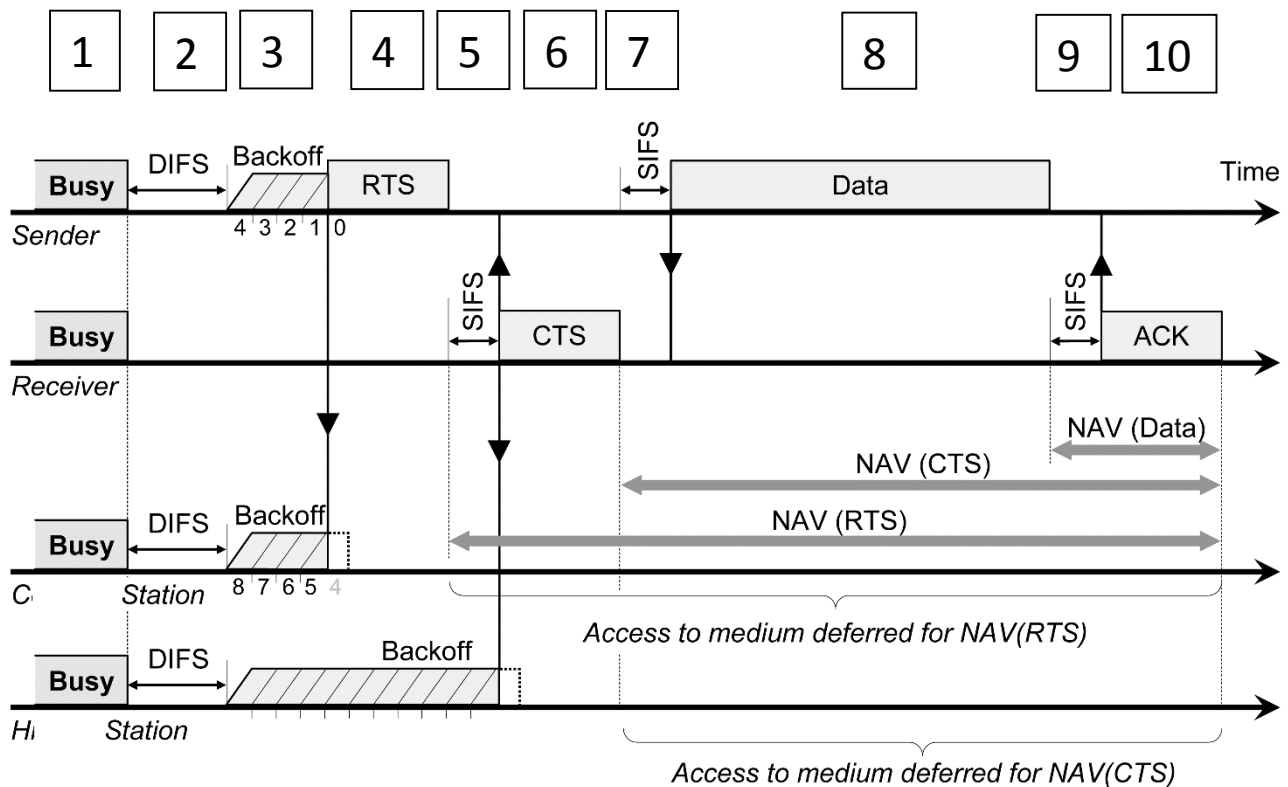
Describe the following services. Specify which part of the 802.11 system provides the service:

- Distribution
- Integration
- Association
- Re-association
- Disassociation

Question 4. (8+2 marks =10 marks)

Consider the following transmission example in an 802.11 network.

- Describe what is happening in each marked time period.
- What problem(s) are addressed in this example? What is the solution to these problems?



Question 5. (2+3+3+2 marks = 10 marks)

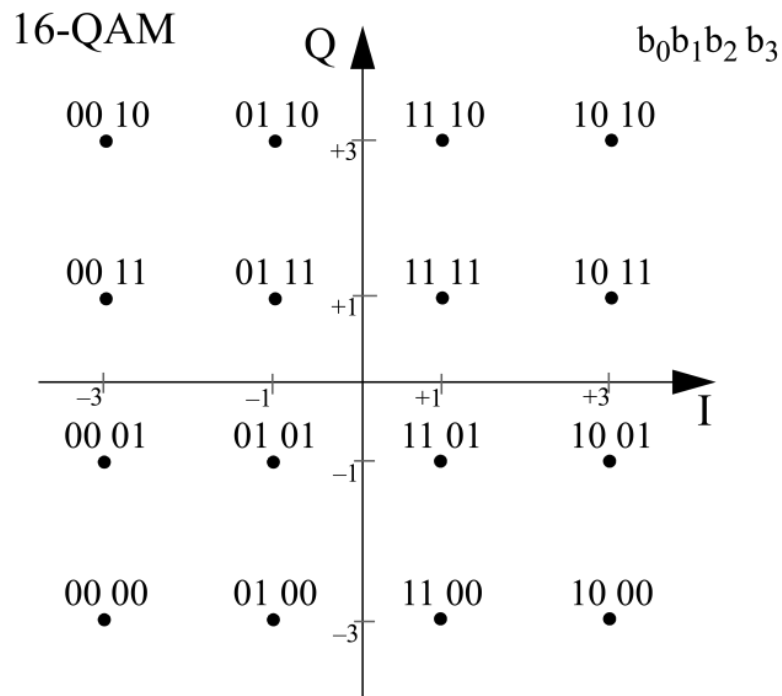
The 802.11 convolutional encoder is described by the following two polynomials

$$g_0 = 133_8 \text{ and } g_1 = 171_8$$

- Explain what convolution is used for.
- Give a block diagram of the encoder.
- Explain how it works.
- What is the bit rate after encoding and why?

Question 6. (6 + 4 marks = 10 marks)

Consider the following constellation diagram of the 16-QAM:



- Knowing that the 12-bit message: $b_0 \dots b_{11}$ is represented by the hexadecimal number: **E3C** write expressions for the **three complex sinusoidal signals** of frequencies f_1, f_2, f_3 , respectively, representing the above groups of bits.
- Explain how this example is related to the OFDM coding.

PART B (Answer any 5 out of 6 questions)

Question 7. (5 x 2 marks = 10 marks)

Explain the principles of OFDM in 802.11 networks. Consider:

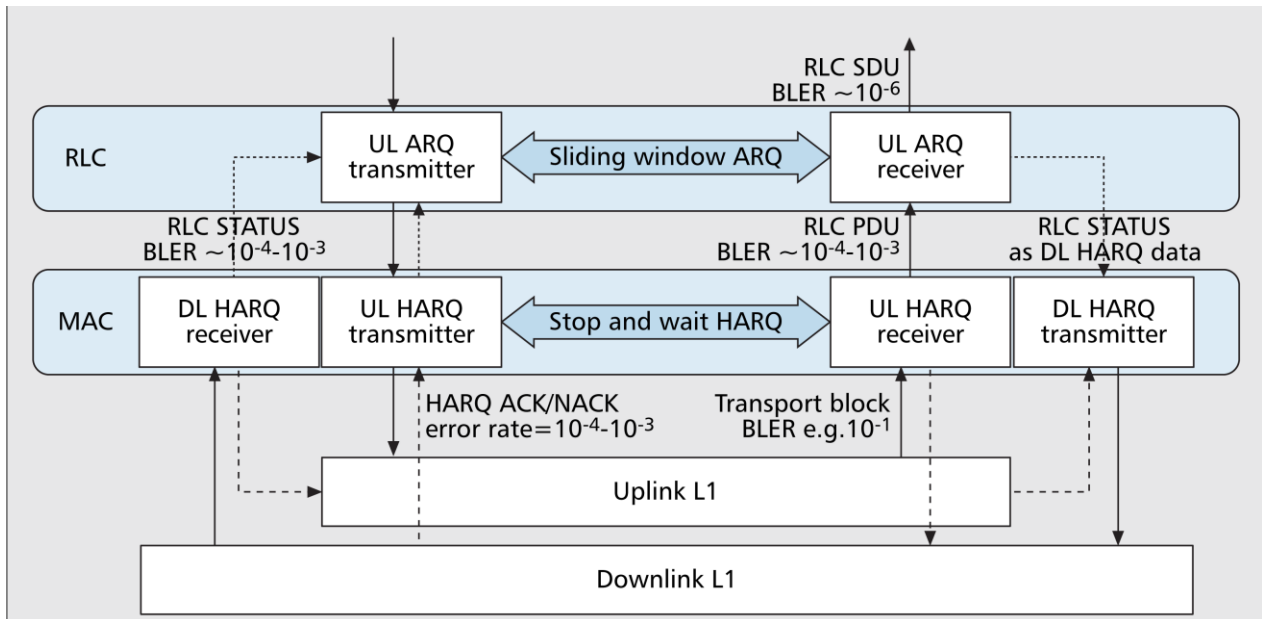
- Number of subcarriers. What do they carry?
- Subcarrier spacing.
- What is a time guard and how it is created.
- What is duration of a symbol? How many bits go into one OFDMs symbol?
- How the time domain signal is created?

Question 8. (2 x 5 marks = 10 marks)

The LTE architecture consists of seven main components.

- Sketch the structure of the LTE architecture.
- Briefly describe functions of the LTE components.

Question 9. (2 x 5 marks = 10 marks)



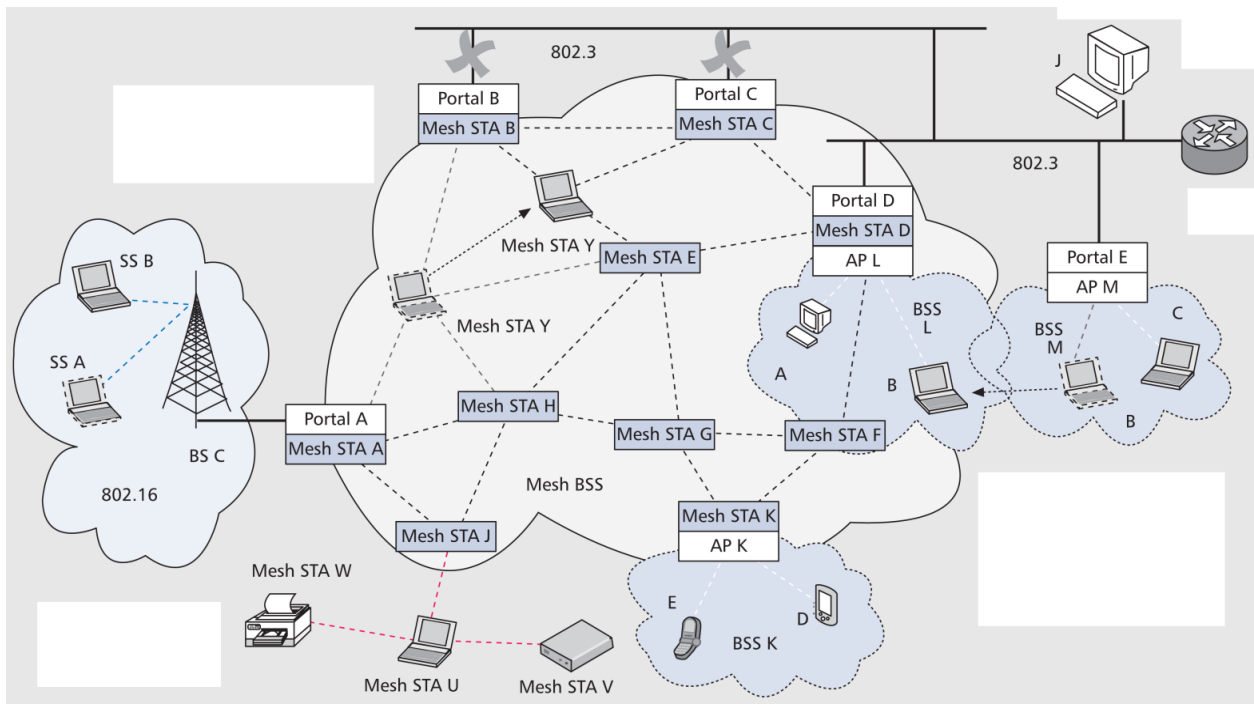
- With reference to the above figure, describe **two retransmission methods** in the data link layer of the LTE.
- Explain why two different methods are required.

Question 10. (10 marks)

Describe the structural and basic functional features of the following 802.11s network.

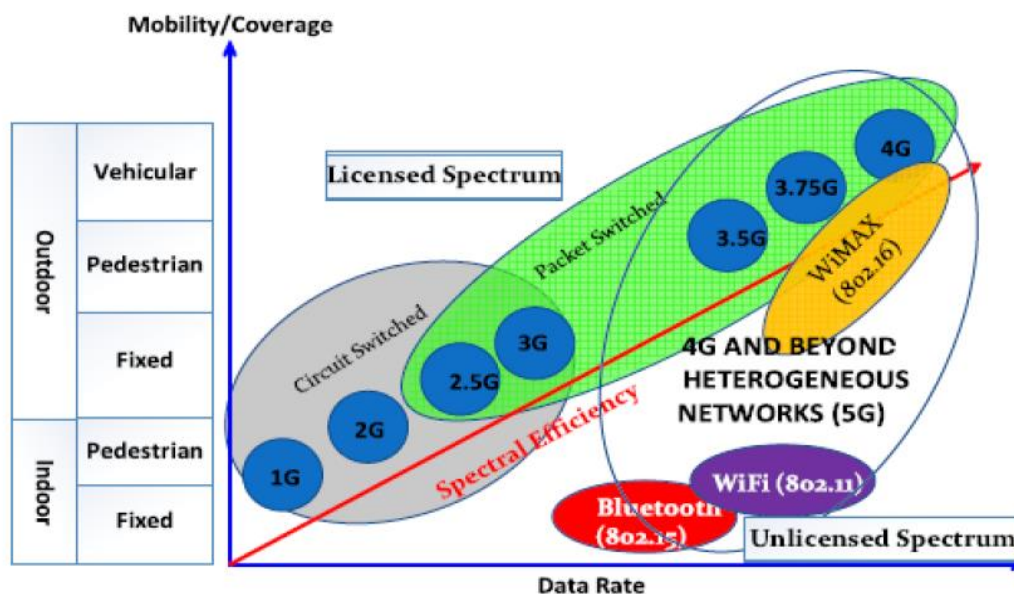
Itemize your answer referring to components of the network such as the mesh stations: A, B, C, D, E, F, G, H, J, K, U, V, Y. Use the format similar to the following:

- The Mesh STA A is ... and its function is to ...



Question 11. (4 + 6 marks = 10 marks)

a) With the aid of figure below, discussion the four main concepts of 5G technology.



b) Fill in the six empty cells in the following table.

Description	5G (targeted for early 2020 first release)
Data rate (bandwidth) 1Gbps	
Technology	
Service	
Multiplexing (CDMA)	Multiplexing (CDMA)
Switching	
Core Network	
Handoff	

Question 12. (2 x 5 = 10 marks)

- Draw a three circle diagram to show IoT (Internet-of-Things) paradigm as a result of the convergence of three different visions. Indicate in each vision circle the components involved that are deployed over wireless sensor networks.
- What are the five key application domains of IoT? Give one example for each application domain.

- The end of this examination paper -