



12 Pages

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1	Student Number	150854
2	Title of Examination Paper	Wireless Networks & Simulation
3	Module Code	ACCBS004
4	Date and Time of Examination	10/01/19 1500
5	Examination Venue	Dylan Thomas Centre
6	Seat Number	606
7	Number of Answer Books handed in	

[illegible]

Q1a

Application, Presentation, Session, Transport, Network, Data Link, Physical.

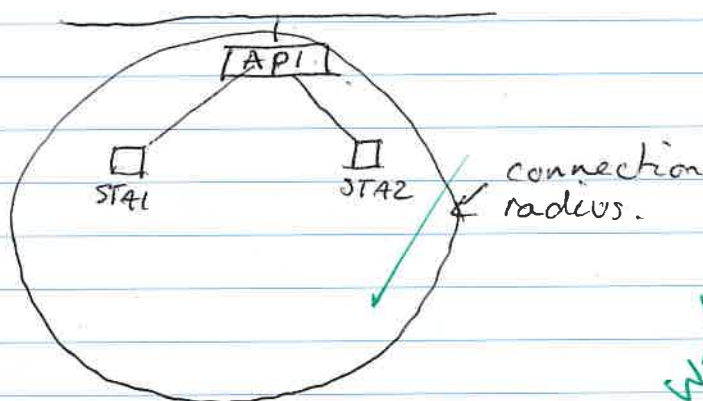
not quite correct

Physical layer is the medium that the packets/data will travel on, i.e. radio waves, straight through cable. Application layer ~~controls~~ controls the what the data is used for (what application the transmission is for). i.e. website, http, music from a streaming service.

4.5

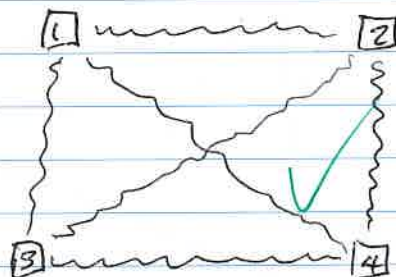
4.5

Q1b. BSS, basic service set, is a static ^{AP} ~~point~~ (access point) that several stations (STA) can connect to to gain access to the network, illustrated below.



well done :)

IBSS, is similar to the BSS in that it is a network connection, however the ~~own~~ stations connect to one another as APs. (A P2P network).



Q1c - CSMA will not transmit a packet if the path to travel is in use, it will wait for the opportunity. Aloha ^{Q3} waits for a confirmation order to begin transmitting.

Q1d. Both WMN + WSN are able to be mobile. WSN uses sensor nodes which have a very short transmission range but are small and economically lower cost less to deploy. WMN uses mobile devices with longer range. missing a lot of information.

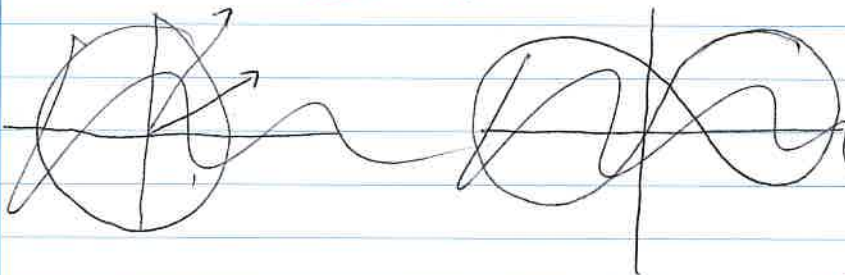
in complete answer

Q3a ~~Applicable to both WSN and WMN~~

Q3b

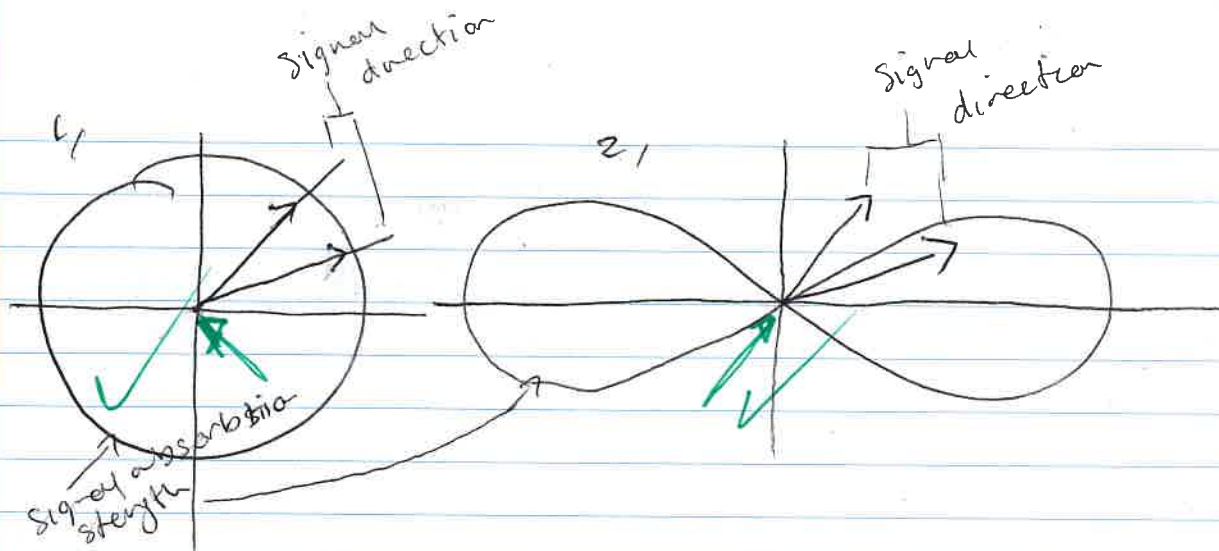
Q3c - Volts measure power in a circuit, $V = \frac{1}{R}$ ~~But $V = IR$~~ .
Power = $\frac{\text{current (A)}}{\text{Resistance (}\Omega\text{)}}$
(V)

Q3d



Watt
 $\frac{V}{t}$

23d



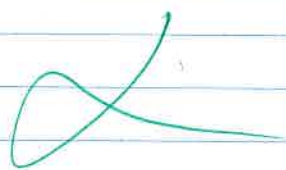
The diagram shows how omnidirectional (1) and directional antennas work.

1) shows that no matter where the direction of transmission, the signal is strong (inside the circle).

2) shows that directional antennas can only point properly, and must be realigned if the direction of transmission is not in the direction of the poles (the larger parts of the figure of 8).

Q4

a)



b) the goals of WPA2 are:

Confidentiality: to ensure the user's information is ~~not~~ not free to view.

Protection: to ensure the user is safe from malicious attacks over the internet.

Reliability?

CIA Model.

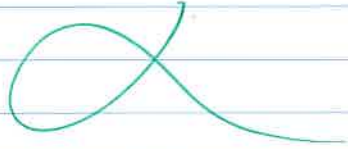
Q4

C.

not quite correct

- i) Bandwidth is the range of frequency the data can travel on/use (eg. 2.4 GHz).

ii)



- iii) ~~Absorption~~ Absorption is the rate at which amount a receiver can receive.

Q4d. The Long Term Evolution Protocol is used by mobile devices, it ^{improves} ~~improves~~ their bandwidth from the previous protocol.

Q22

2a) WLANs & LANs are different for a few reasons.

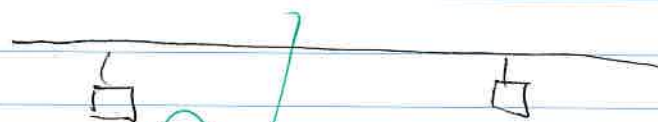
reliability, a wired network has a constant transmission data flow eg 100MB/s but a WLAN's connection speed may vary as the user station may be mobile or there may be radio interference causing a drop.

medium wireless
CD vs CA wired

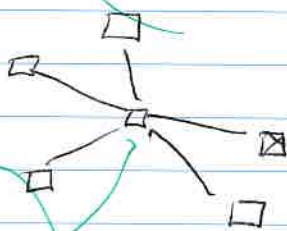
2b) DHCP - Dynamic Host Configuration Protocol?
UDP

IEEE → IEEE 802.11
ISO → HDLC

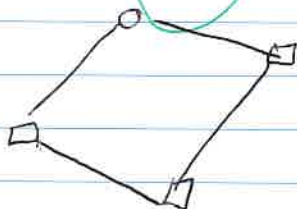
2c) Serial



STAR



Ring



802.2 LLC
802.11 MAC
PHY
OFDM

Serial ^{data} flows in one line, from station to station until it finds its destination.

Star has one central host that has many stations connected, data always goes through the host station before anywhere else.

Ring topology has a one directional flow of data, it goes ~~and~~ around the ring ~~and~~ until it finds its destination.

Q2 d.

Adv.

- High capacities/

~~Reliability~~

- ~~Long ranges~~ Long Ranges.

Dis.

- ~~Costly~~

-

0.5

0.5



1. A

Application

Presentation

Session

Transportation

Network

Data link

Physical

u.s

4.5

2. Major function of any two two layers from above are.

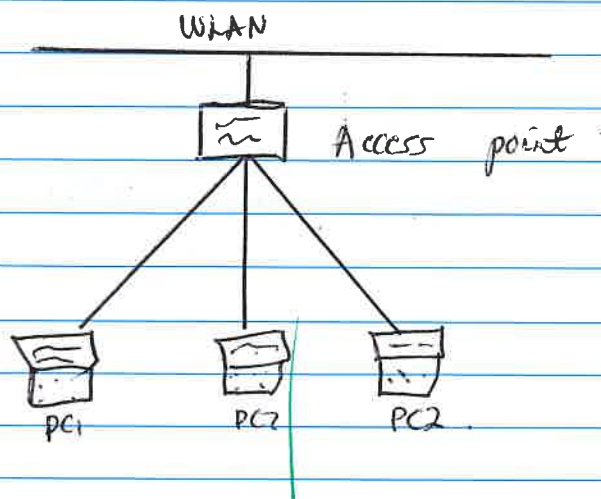
- Network layer is used to enables devices to reach each other, that works from one point to the next point.

- Transportation layer is used to enables application on devices to communicate.

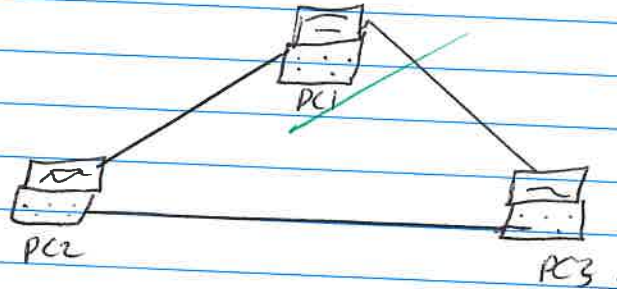
TCP UDP transportation

B. Difference between basic service set (BSS) and independent BSS (IBSS) are :

- BSS is function as a group of machines or computer link through one access point through the WLAN Distribution point.



- IBSS is function as without access point and work as same as peer to peer network, sending and receive data each other without any point.



- C. Difference between Carrier Sense Multiple Access / Collision Avoidance (CSMA/CA) and Aloha access mechanism.

- (CSMA/CA) is a ^{radio} data transmission but focus on wireless, also has a possibility to reduce the collision and can deal with the any effect before the collision while missing info.

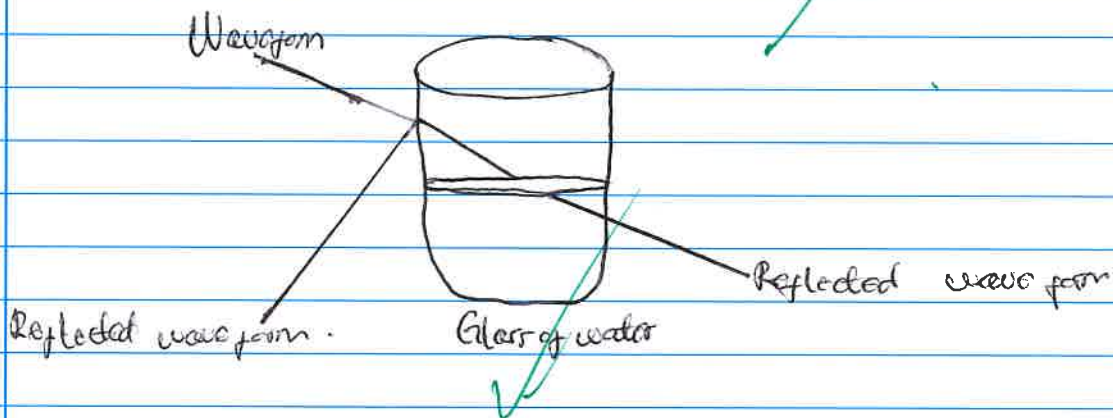
Aloha access mechanism is a first radio data transmission before CSMA/CA and CSMA/CD was intention of transmit data from one machine to another. But this should have a hub the one deal to transfer data and another machine to receive, it will ~~key~~ send packet tell get notification of received and only work is a one way. not quite correct

SA- Converged networks is the way of using multiple communication in a single network, such as telephone, video and data communication.

- Two example are:

- Social media ~~app~~
- Satellite.

B- Signal refraction issue is in the bonding of, a wave passes through something in to different density. That will make a wave either ~~reflected~~ through the glass or water or reflect by bending.



D- The Effective area for Parabolic reflective antenna is $0.56A$ while A is a p.c. 50 .

$$i \quad A_e = 0.56 \times A$$

$$A_e = 0.56 \times 3.141$$

$$A_e = 1.758 \approx \underline{1.76 \text{ m}}$$

ii The antenna gain for Parabolic Antenna is $7A/\lambda^2$ for this formula, so
- Should find the wavelength first.

$$c = \lambda \times f$$

$$\lambda = \frac{c}{f}$$

$$\lambda = c/f$$

$$\lambda = \frac{(3 \times 10^8)}{12}$$

$$\lambda = 25000000 \text{ m}$$

So the antenna gain in dB is

$$7A/\lambda^2$$

$$= \frac{7 \times 3.141}{(25000000)^2}$$

$$G = 3.51792$$

$\therefore$ The antenna gain for Parabolic is
3.51792 m $\approx$ 351792.

While

$C =$ light of speed ($3 \times 10^8 \text{ m/s}$)

$f =$ frequency.

$\lambda =$ Wavelength.

$G =$ Antenna gain.

$A_e =$ Effective area,

- C. Yes it is important because in order for the all laptops receive the correction of communication should be a data link layer, that will create network data for physical network and network layer that will enables laptops to reach each other in a communication way.

not quite correct

2.5

2.5

2D Advantages of Wireless ATM

- i flexible bandwidth allocation ✓
- ii Soft handling without any data loss ✓

(5)

Disadvantages

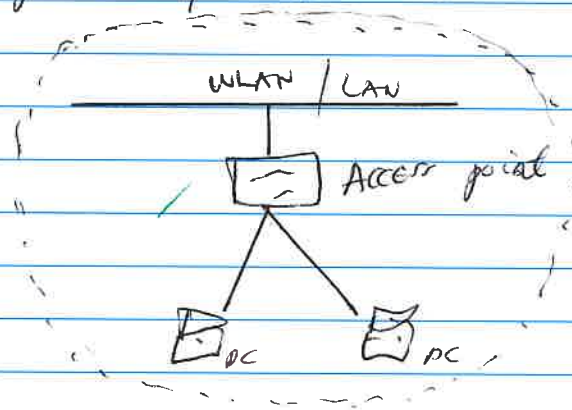
- i Delay the multipath interconnection ✓
- ii Finish a suitable at the channel ✓

(5)

C. The IEEE 802.11 logical topologies is a network topologies that used by machine with the access point for connection and WLAN point or LAN

0.5

(0.5)



E. Properties of electromagnetic waves:

- form of light ✓
- Turn in. to heat ✓

Amplitude

Period
wavelength
frequency

(5)

(0)

A. Wireless LAN WLAN

- It can connect to a different without sending ~~through~~ a cable.
- The devices can easily access network at any time Both do
- That can link devices either at school or office, → Speed in good standard.

4.5

4.5

(4.5)

LANs

medium are different

- If one ~~device~~ cable failed it will cause problem. CD
- The speed will be low
- The way of connection it can be either by ring, star or bus topology.

Vs. CA

Rhif Cwestiwn

4A. Yes the data link layer still needed because of continuously ^{control} data flow, without it the Internet, network access can perform the function of flowing data.

4.5

4.5

Ci Bandwidth is the amount of data transmitted through the system, that can be 1bit per second.

2.5

ii Multipath ^(1/2) is the way of ^{signal} data transfer in two different ways but at the same time.

2



12 Pages

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1	Student Number	P150771
2	Title of Examination Paper	wireless network and simulation
3	Module Code	ACCB5004
4	Date and Time of Examination	10/1/19 at 3pm
5	Examination Venue	Virion hall dylan thomas centre
6	Seat Number	6018
7	Number of Answer Books handed in	4

List the numbers of the questions you have attempted	Office Use
1	9
2	12
4	5.5
3	14.5
Office Use	470

Q1

A. Apstcndp

1. ~~AM~~ Application layer
2. presentation layer
3. Session layer
4. Transport layer
5. Network layer
6. Datalink layer
7. physical layer

The major functions of the application layer is to run services such as ~~web~~ websites and file transfer using the protocols such as HTTP and FTP.

The major function of the physical layer is ~~the~~ send and receive bytes of data over physical mediums such as ethernet and fibre. and ~~is~~ also wireless.

B Not attempted

6. CSMA/CA is used to ~~avoid~~ help avoid ~~errors~~ the collisions that occurs over wireless mediums. This service actively waits and makes sure that there is no contention before sending the data. ✓

2.5

2.5

Aloha service mechanism ask the receiving Device if it is free to receive more data. ~~upon receiving~~

1.5

- D. Wireless mesh network uses multiple devices each interconnected with each other and are all acting as an transmitter and receiver. This can be implemented in areas where High bandwidth is needed. But this is a very costly implementation. on the other hand there is WSN which is an interconnected low power device system that operates on a Central Hub. This could be used to track people in a shop. WSN networks operate ~~cost~~ on low power and are more cost effective to install.

1.5

1.5

in complete answer.

Q2a. Wireless lans are different from lans due to the way they transmit data from one device to another

Wireless lans use electromagnetic waves to send data using a standard called 802.11 which is developed by IEEE. using a transmitter, a receiver and a pair of antennas they are able to send data through the airspace in order to reach another device

U.S.

U.S. CA

lans use electronic pulses to send data over wires such as twisted copper pair and coaxial.

B Data Link Layer Standards

Frames and segments

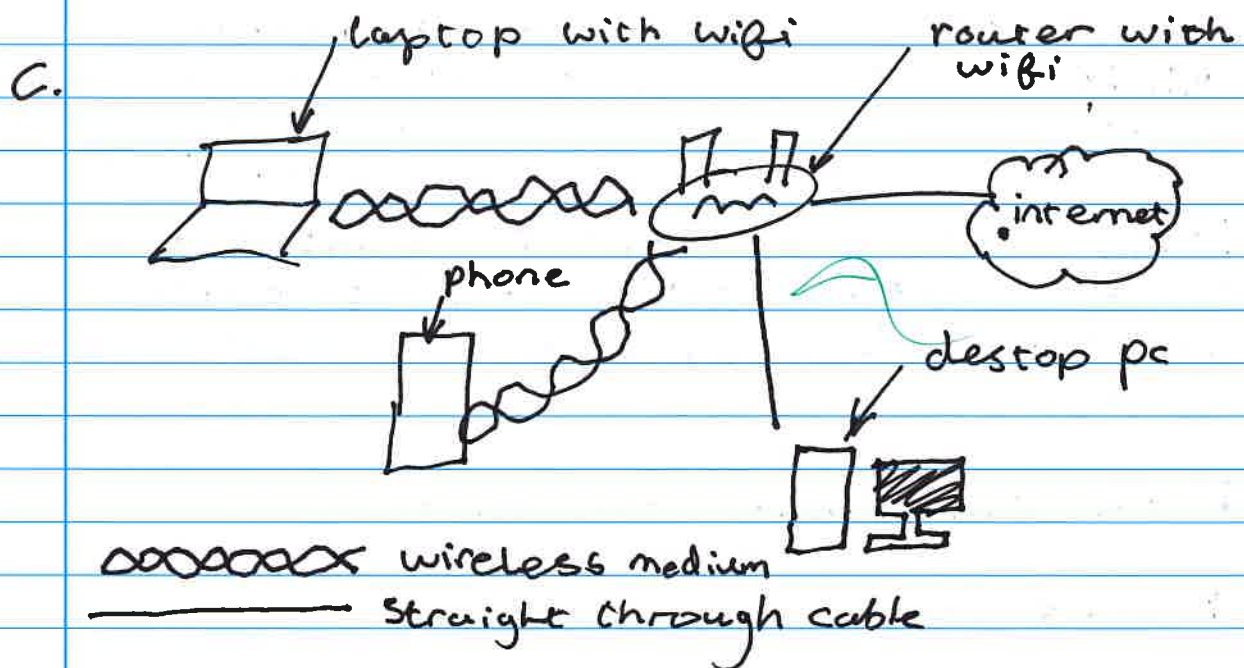
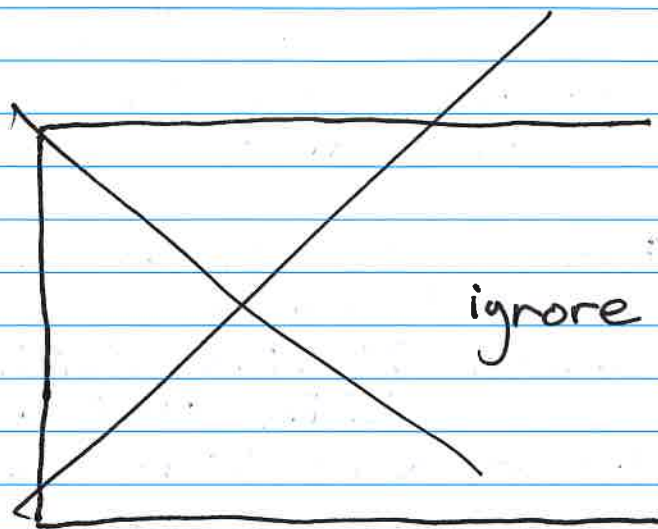
Tcp and UDP

IEEE → IEEE 802.11

ISO → HDLC

c. the tradition topology would be the use of 802.11 in a Home environment which you can see on the next page.

802.2 LLC		DLL
802.11 MAC		
OFDM		PHY



D. Advantages

- Superior QoS
- Can be used for voice video and data

Disadvantages

- Cost of implementation
- Low bandwidth

3

3

F. properties of electromagnetic waves

- wavelength
- Frequency
- ~~amplitude~~ amplitude

4.5

4.5

Q4

- A. The data link layer is still needed because it processes frames ready to be sent and received. error detection is just an add-on to improve QoS.

4.5

4.5

B. WPA2 security goals.

- use a 256 bit key to enable high encryption of data
- to replace TKIP with the new standard AES
- Remove the pre shared key (PSK) and drop support for legacy hardware.

0

0

C.

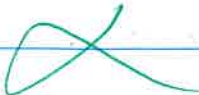
i. Bandwidth.

The total throughput that the medium can ~~expose~~ take before starting to bottleneck

1

- ii. Multipath is used to send data ~~multiple different paths~~ ~~across~~ ~~paths~~ across a network to allow more chance of the data arriving at the desired destination.

1

D not accepted 



E not accepted 

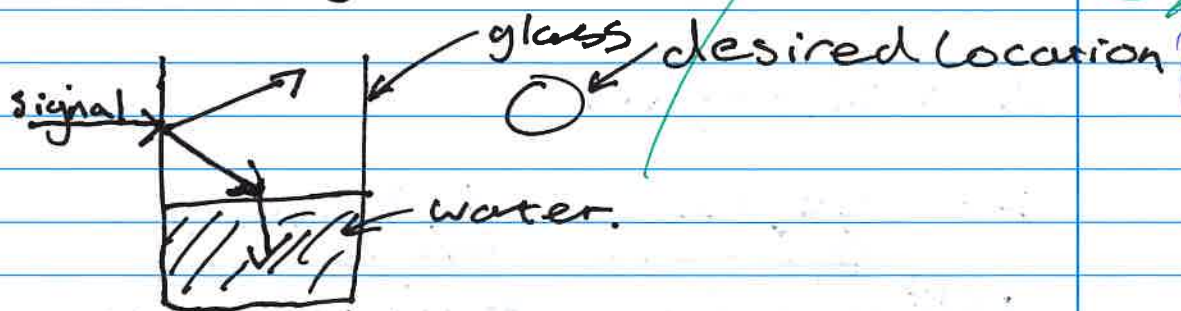


Q5 Converged networks is the processing of different data type all at the same time.

For example if you are in a conference call ~~you~~ you are going to need video data and ~~voice~~ voice at the same time.

If you are doing some electronic courses online you are going to need video and text data.

B. Signal refraction is the issue where the electromagnetic waves are being lost when it hits a dense transparent object. Such as water or glass.



Because the material isn't reflective the waves hit and then get distorted.

no need for routing

- C. ~~the network layer~~ The data link layer would be more appropriate for error detection and the reconnection of lost packet ~~sig~~ since the air waves are going to be very congested. ~~X~~

2.5

2.5

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

$$A_e = 1.2\pi = 3.768$$

$$\lambda = \frac{3 \times 10^8}{12}$$

$$\lambda = \frac{300,000,000}{12}$$

$$\lambda = 25,000,000$$

$$G = \frac{4\pi \cdot 326}{\frac{625 \cdot 25,000,000^2}{90,000,000,000,000,000}} = \frac{6,814.95}{\frac{390,625,000,000,000,000}{90,000,000,000,000,000}}$$

~~$$G = 1.25 \times 10^6$$~~

$$G = 7.3572 = 7.572$$

$$G = 0 \text{ dB}$$

4

4



Examination Answer Books

12 Pages

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1	Student Number	P151758
2	Title of Examination Paper	wireless networks and simulation
3	Module Code	ACCB5004
4	Date and Time of Examination	10/01/19 3.00 pm
5	Examination Venue	Dylan Thomas Centre
6	Seat Number	G1003
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
Q1 A	2
Q1 B	3.5
Q2 A	4.5
Q2 B	0
Q2 C	0
Q2 E	0
Q3 D	4
Q4 A	5
Q4 C	3
Q4 D	8
Q4 E	0
Office Use	

Q1

A)

- Application Layer ✓
- Design Layer ✗
- Network Layer ✓
- Data Link Layer ✓
- Transport Layer ✓
-
-

(2)

(2)

The ^{Data Link} ~~network~~ layer of the OSI model consists of 2 sub layers, LLC and the MAC.
 missing info

B) The differences between BSS and IBSS are :

- A Basic service set is a building block ^W LAN.
 covers a single area.
- A BSS ~~is~~ also uses infrastructure mode.
- Independent basic service set (IBSS) is the most basic type of WLAN.??
- ~~Peer~~ IBSS is also a peer-to-peer network.
- BSS and IBSS are two different types of service - BSS is a LAN, and IBSS is a ~~basic~~ basic WLAN.

(3.5)

(3.5)

Q2

- A) - LANs are much faster. Ethernet
- Local area networks are more common when computers stay in one place. And Wide area networks are more common where computers are often moved.
 - LAN is more secure than a WLAN.
 - Can connect multiple devices to a WLAN.
 - WLAN is more vulnerable to attacks than LAN.
 - WLAN is more flexible - you can move the devices about without disconnecting to the internet.
- CD vs. CA

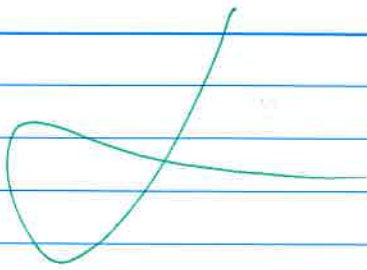
- B) MLP Layer 9
MAC Layer 9

①
IEEE → IEEE 808.11
ISO → HDLC

- C) ① BSS - ~~Also a peer-to-peer network~~ Building block ~~covers a single area~~ uses infrastructure mode.
- ② IBSS - Most basic ~~type~~ type of LAN.
- Peer-to-Peer network
 - No DS.
- ③ ESS - Connected by 2 or more basic Service Set (BSS).
- ~~No distribution system~~ - Creates wireless network.
- ④ Distribution System (DS) - LAN or WAN.
- Has addressable entities.
- ⑤ Roaming - ~~user is invi~~ When APs switch among each other - user is invisible when this happens.

802.2 LCC	Data Link
802.11 MAC	
FH, DS	Physical

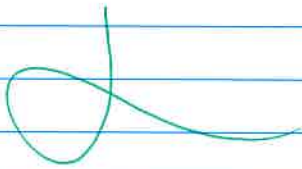
D)



- E) ① Travels at the speed of light.
 ② Travel through space

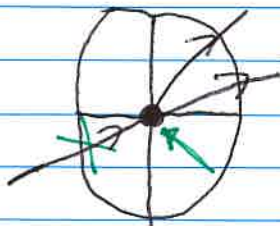
Q3

B)



D) ① Omni-directional.

- Also known as 'non-directional'
- Diagram

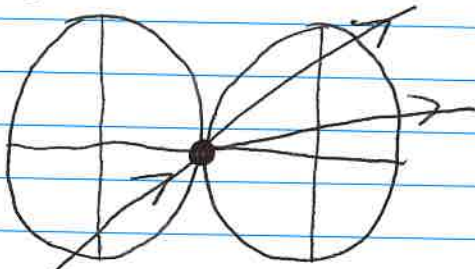


Antenna
Location

- Doesn't focus in a certain direction
-

② Directional.

-Diagram



Antenna
Location

- These antenna's ~~are~~ focus in one direction (preferably)
- Used in long hallways, big buildings

Q4

A) -Yes.

- Because the data link layer still provides the logical link control (LLC) which provides the services to the upper Layer Protocol (ULP).

⑤

⑤

c) i) Bandwidth - The amount of data transmitted in a fixed amount of time.

③

③

ii) Multipath - Amount of data transmitted to more than one pathway.

D) Long Term Evolution is next step for cellular 3g services. It will provide increased bandwidth. downlink speed of 150mbps and uplink speed of 50mbps.

(5)

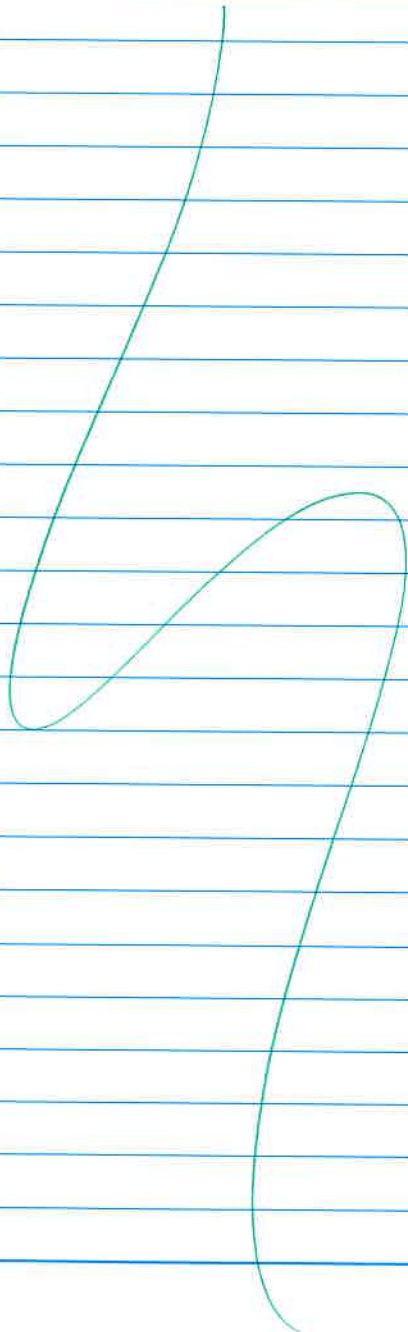
(5)

E) The Long term evolution protocol has a larger bandwidth, scalability, and can provide more users with faster internet. (Larger capacity).

(0)

(0)

B)





u.5

4 1/2

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2	Title of Examination Paper	Wireless NETWORKS + simulation
3	Module Code	ACCB5004
4	Date and Time of Examination	10/01/19 15:00
5	Examination Venue	DYLAN THOMAS CENTRE
6	Seat Number	G015
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
1	15
2	7.5
3.	13
5.	7
Office Use	42.5

$$\begin{array}{r} 15 \\ 7.5 \\ 13 \\ 7 \end{array}$$

42.5

1 A

APPLICATION
PRESENTATION
SESSION
TRANSPORT
NETWORK
DATA LINK
PHYSICAL

u.5

A 1/2

Transport layer is responsible for transportation of data via TCP or UDP.

~~Network layer is responsible for~~

Application layer is the interface between the user and the network. X

u

1 B. BSS would be part of any wireless network where an access point is required.
not enough. → wired not fixable. etc.

A

IBSS would only be used in a peer-to-peer wireless network where the devices communicate without an access point, as they talk directly to each other.

1 C. Carrier Sense Multiple Access / Collision Avoidance works by devices sending a RTS (request to send) packet to the access point before sending data, and only sending when a CTS (clear to send) packet is returned. whereas aloha access provides constant updates when the channel is clear for data to be sent.

2.5

2 1/2

Aloha sends constantly with no checks. uses repetition protocols.

10. ~~WLAN~~ Wireless Mesh networks are centrally controlled multiple Access point networks, where a single SSID and password is used to allow it to function as a single network. *centralized, requires physical medium.*

Wireless sensor networks are not centrally controlled with no one node taking responsibility and multiple routes available, these networks tend to be low cost + low power. *gen mean per node per.*

4

A

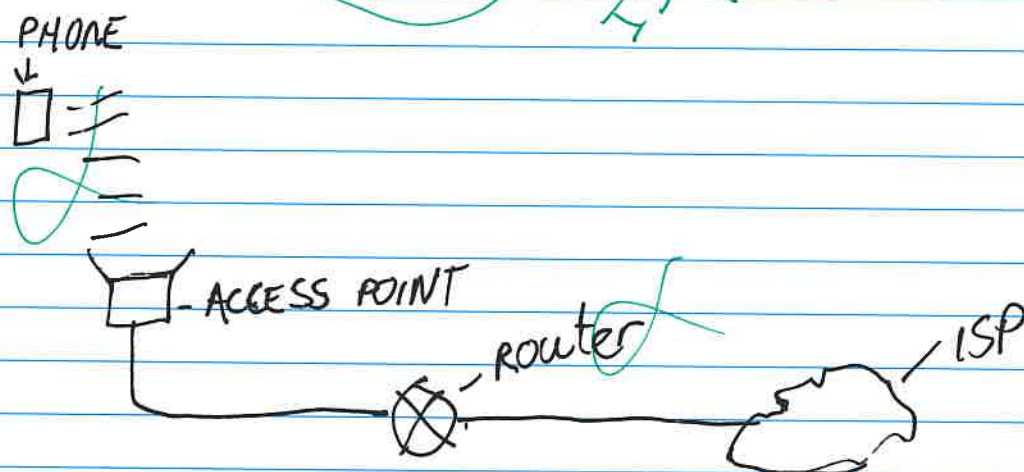
2A. wireless LANs are not bound by cables, allow for greater scalability, lower cost and use RF or IR for transmission.

wired LANs are ~~reliant~~ reliant on where cables can run, not as scalable, higher cost and generally use copper or fibre for transmission.

B. ETHERNET is a data link layer standard
MAC ADDRESS is a data link layer standard

ARP is a data link layer protocol that maps MAC address to IP address.

C.



The end wireless device connects to an access point. This then connects to a network in the diagram cable via a router this router then connects to an ISP allowing Internet access

D. ~~ALLOW MULT~~

ADVANTAGES

- ALLOW multiple transfers of data at one time.
- use a single channel

not the correct terminology

DISADVANTAGES

- Greatly ~~as~~ affected by interference
- Low distance travel only (short range)

E. • TRAVEL AT THE SPEED OF LIGHT

- REFLECT OFF SURFACES
- CAPABLE OF long distance travel
- AFFECTED by electromagnetic interference.

3A. UDP would be the preferred protocol for live video streaming as it is best for transmission where low overheads and the order of delivery are not so important, very very useful for traffic that needs to be as real-time as possible

B. ~~PROV~~

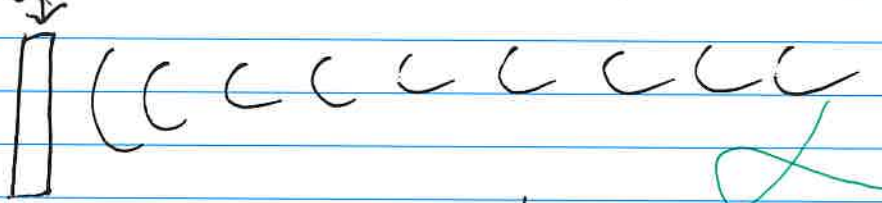
C. Decibel or dB is the basic unit of power.

It can be calculated as follows

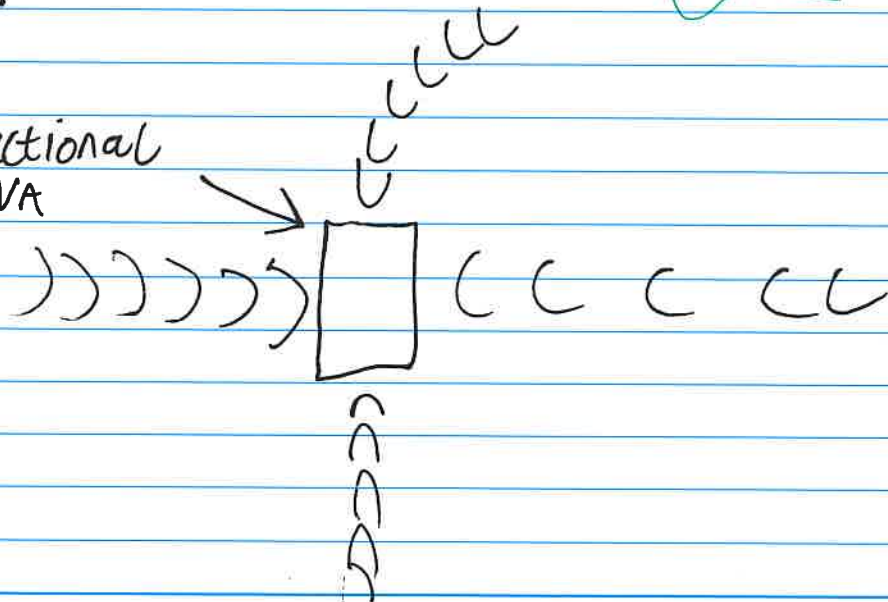
$dB = 10 \log_{10} \text{ range of transmission} \times 10 \log_{10} \text{ speed of transmission} \times 63.$

D.

Directional ANTENNA



Omni Directional ANTENNA



~~30~~ 30 Directional Antenna are designed to ~~PROPAGATE~~ PROPAGATE signal in one ~~direct~~ direction. ~~It~~ This can be rather useful for wireless point-to-point links as the antenna can directly be aimed to wards each other.

Omni directional antenna are designed to propagate signal in multiple ~~or~~ directions. This is far more useful in standard networks, such as a home network where the antenna can be ~~be~~ placed in a central location to give the best coverage possible.

8

8

5A. Converged networks are a type of network where multiple services are ran at once.

Cellular providers run a converged network as voice, message traffic and cellular data all run via the same method of communication.

ISP networks are also an example of a converged network as they now run voice, video and Internet traffic all across the same network medium.

B. Signal refraction is where the signal bounces off a surface and is slightly later arriving to destination.

C. The data link layer would be more appropriate for this situation as the information would be exchanged via source and destination MAC address rather than IP address.

D.

$$C = \frac{4 \cdot \pi L^2}{A \cdot c} =$$



Examiner Only

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either accept a handwritten script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	1603340
2	Title of Examination Paper	Wireless Networks and Simulations
3	Module Code	ACCB5004
4	Date and Time of Examination	10/01/2019 15:00
5	Examination Venue	Dylan Thomas Centre
6	Seat Number	G014
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	5.5
2	6.5
4	5
5	~~8.5~~ 6
Office Use	22 18

(Gweler yr ochr arall am y fersiwn Cymraeg)

Q1

- A)
- Application ✓
 - Network ✓
 - Transport ✓
 - Physical ✓
 - Data ~~✓~~
 - System ~~✓~~

not quite correct

Network - Used to connect devices together

Transport - Used to transfer data between devices.

- B) BSS has multiple connection points whereas IBSS only has one.

- C) CSMA/CA will first check if another computer is currently sending data before sending data itself, this is to ensure packets of data do not collide and corrupt.

Aloha access mechanism will queue itself and other machines using Aloha access mechanism so that data can be sent seamlessly after another user stops sending data.

- D) A wireless mesh network is a collection of wireless devices that can send and receive data from one another and are always connected, a wireless sensor network is multiple machines sending data back to one machine that can talk back to them.

Q2

missing a lot of content (25)

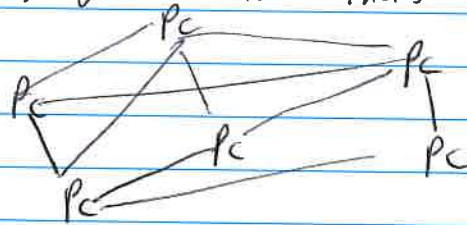
A) A WLAN is different to a LAN in the way that it sends data across the network using radio waves instead of current down a wire.

B) Network ~~X~~
Transport ~~✓~~

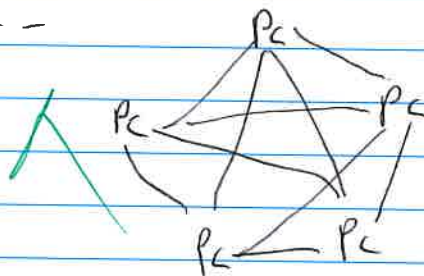
C) Bus - a row of computers connected in a line if one PC goes down they all do



Mesh - multiple machines all connected together if one goes down no others are affected.

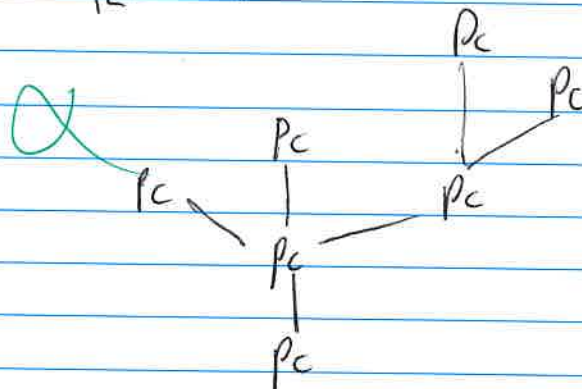


Star -



Similar to mesh but with limited ability to expand in the future.

Tree



Similar to bus.

D)

Advantages

Quick and easy to setup ✓
 Can easily add to the network.

terminology
is incorrect

4

Disadvantages

Slower data transfer speeds ✓
 lower & range than a traditional wired layout.

X

E)

Sin waves

Hz

effective area

0

0

Q4

A) Yes, Since the data link layer is used to bundle the incoming data into a new form that can be processed by the end machine transmission control

2.5

B) anti denial of service attacks collision techniques etc.

C)

i) Bandwidth - ~~the volume of data being sent~~
 ✓ The available volume of data that
 ✓ could be sent/received. Signal

2.5

ii) multipath - where packets of data take different routes to get to their destinations.

2.5

iii) Absorption - ~~When radio waves bounce off physical objects~~
 ✓ When radio waves bounce off physical objects some of their energy is absorbed by the object.

D) ~~LET~~ LET is the next iteration of the OSI model that features 4 layers instead of the current 7

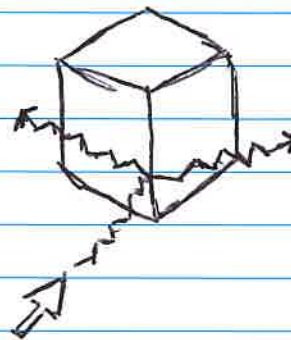
E) LTE allows for ~~a~~ a larger bandwidth to be processed over the ~~LET~~ but as a drawback has a smaller capacity currently.

Q5

A) Star Mesh

B) Similar to light radio waves suffer from diffraction, when a radio wave hits the corner of a medium the wave can be split.

change of medium rather than corners. that's diffraction.



C) The network layer would be more appropriate for this scenario since it is used to connect devices together.

D)

$$G = \frac{4\pi A_e}{\lambda^2} = \text{---}$$

$$G = \frac{7.28844}{(3 \times 10^{10})^2}$$

diameter 1200 mm
operating 12000 000 000 Hz
(1) Sol 3000000 000

Parabolic A_e 0.58
(G) effective area

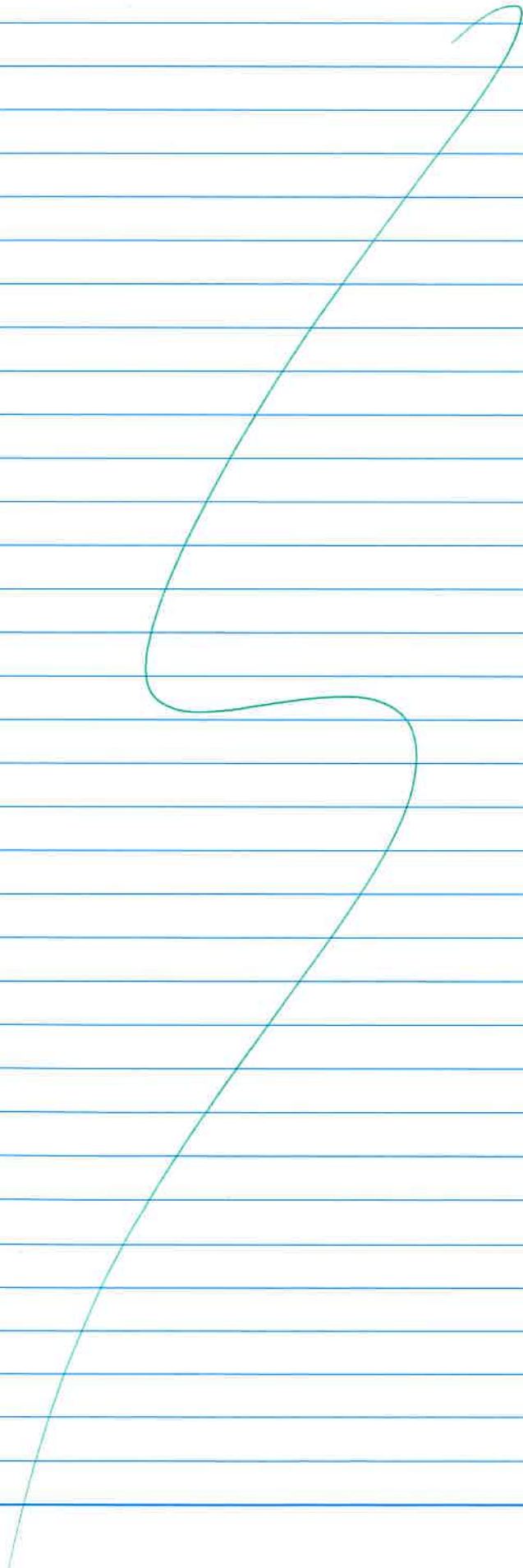
i) $G = 8.048327729 \times 10^{-21}$

ii) 0.58



Question No.

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