Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Examination Answer Books

12 Pages

Complete, fold and seal
(see note 2 below)

SURNAME: Joseph

FORENAME(S): Cerys.

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 ignore illegible 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	
2	Title of Examination Paper	Signal & Digital Communication
3	Module Code	SGEE5005
4	Date and Time of Examination	23/5/24 Start 9:30
5	Examination Venue	ColegSirgar Llanelli
6	Seat Number	

7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
A	16.
B1	10
B2	5.
Total	31%.

31%

(Gweler yr ochr arall am y fersiwn Cymraeg)

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Llyfr Atebion Arholiadau

12 Tudalen

Llenwch, plygwch a seliwch
(gweler nodyn 2 isod)

CYFENW:

ENW(AU) CYNTAF:

Cyfarwyddiadau i Ymgeiswyr

1. Rhowch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhowch eich enw yn y lle a ddarparwyd ar y dde, plygwch ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarllenadwy. Gall yr Arholwyr naill ai anwybyddu sgript annarllenadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.
6. Ni ddylid rhwygo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyliwr/gwylwyr.
8. **Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.**

1	Rhif Myfyriwr	
2	Teitl y Papur Arholiad	
3	Cod y Modwl	
4	Dyddiad ac Amser yr Archoliad	
5	Lleoliad yr Arholiad	
6	Rhif Sedd	

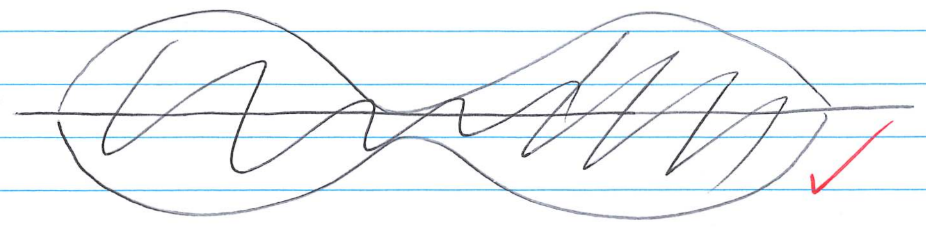
7	Nifer y Llyfrau Atebion a gyflwynwyd	

Rhestrwch rifau'r cwestiynau a ymgeisiwyd gennych	At Ddibenion y Swyddfa
Cyfanswm	

(See the other side for English version)

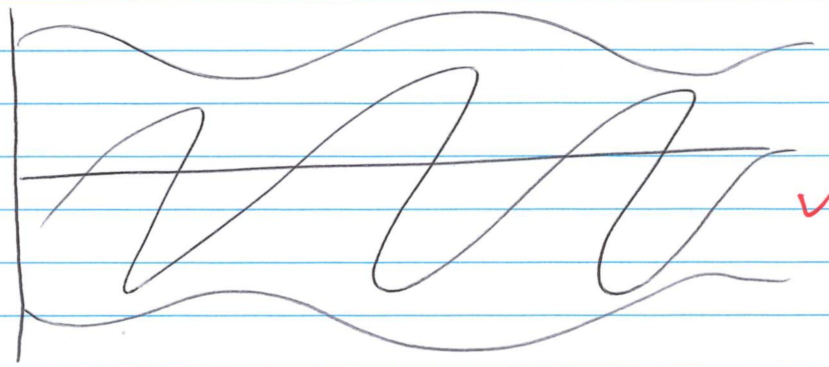
Section A

1.)



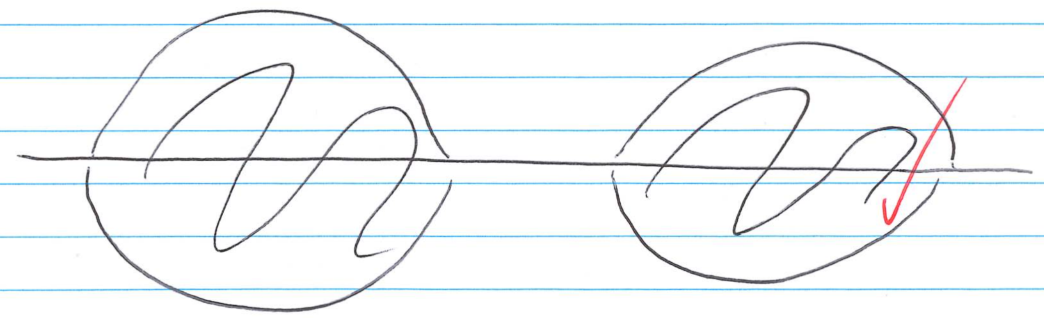
1

m = 1



1

m = 0·5



1

m = 1·5

3

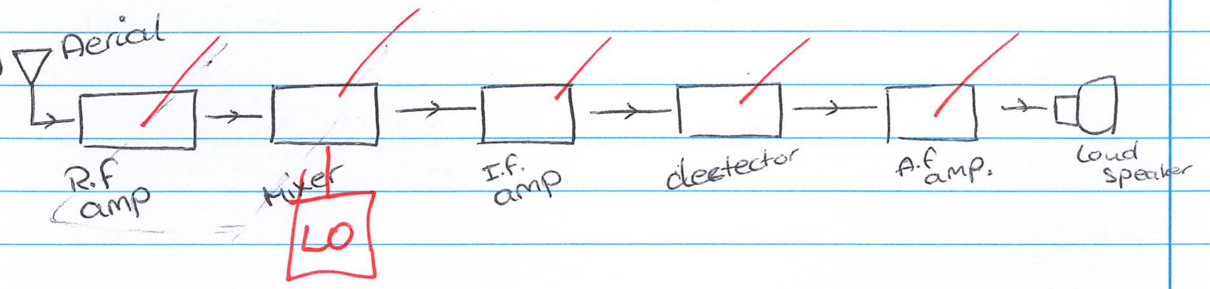
③

2.) $m = \frac{V_{MAX} - V_{Min}}{V_{MAX} + V_{Min}} = \frac{17.5 - 4.5}{17.5 + 4.5}$

$= 0.590$ ✓ 2

3.) - noiseless reception ✓
- large operating range. ✓
- high transmission efficiency. ✓

3.

6.) 

Aerial - feeds to the Station.
Rf amp -
Mixer - Alters the frequency Carrier. ✓
I.f amp -
detector - Selects radio Station. ✗
Af amp - ~~f~~ Sents to the loud Speaker.

3

7.) flash ADC has parallel comparators, each Comparator

1

n - bit encoder.

9 ⑨

Question 1B.

d.) $(\delta fc) = f_{MAX} - fc = 230\,kHz - 200\,kHz$ ✓ 1

$= 30\,kHz$

$(B) = \frac{\delta fc}{f_M} = \frac{\cancel{30kHz}}{\cancel{20k}} = \frac{30\,kHz}{20\,kHz}$

$= 1.5$ ✓ 1

30

$J_0 = \cancel{1.5} \times 0.51 = 0.765$

$J_1 = 1.5 \times 0.56 = 0.84$

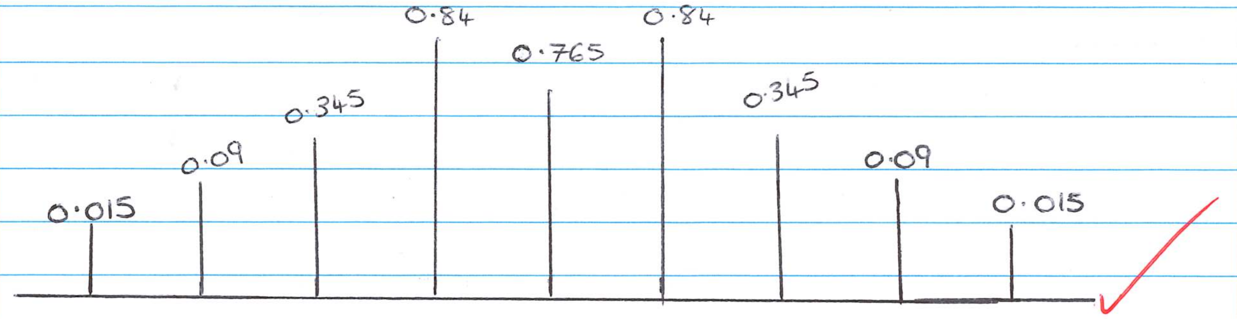
$J_2 = 1.5 \times 0.23 = 0.345$

$J_3 = 1.5 \times 0.06 = 0.09$

$J_4 = 1.5 \times 0.01 = 0.015$ CARRIED error

~~J_5~~ [illegible]

4.



✓ 3.

Question 1B.

c.) $e = Ec \cos(\omega ct + Mf \sin \omega st)$.

$e = 18 \cos(\cancel{2}5 \times 10^8 t + 6 \sin(3000t))$

Carrier frequency $= 5 \times 10^8$

Signal frequency $= 3000$. $(6 \sin(3000))$ ✗

Modulation Index $= 18$.

Maximum frequency deviation =

0

9 ⑨

Question B1.

b)

$V = 14(1 + 0.65\cos 25120t)\sin(5.027 \times 10^6 t)$ Volts.

i) $V_{Min} = E_c - mE_c$ ½ ~~= 12.98~~ -

$V_{MAX} = E_c - mE_c.$ ½. ~~= 12.98~~

$f_c = \frac{f_{MAX} + f_{Min}}{2}$

~~V = [Ec ± Vs] Cos (ωct)~~

~~V = mEc / 2m~~ [illegible] ~~= 7.~~

~~Vmin = 1~~

$V_{Min} = E_c - mE_c \quad = 12.98 - 2$

$= 10.98$

$V_{MAX} = E_c + mE_c \quad = 12.98 + 2$

$= 14.98$

$f_c = \frac{f_{MAX} + f_{Min}}{2} \quad$ ~~= 12.98~~

1

$= \frac{14.98 + 10.98}{2} \quad = \frac{25.96}{2}$

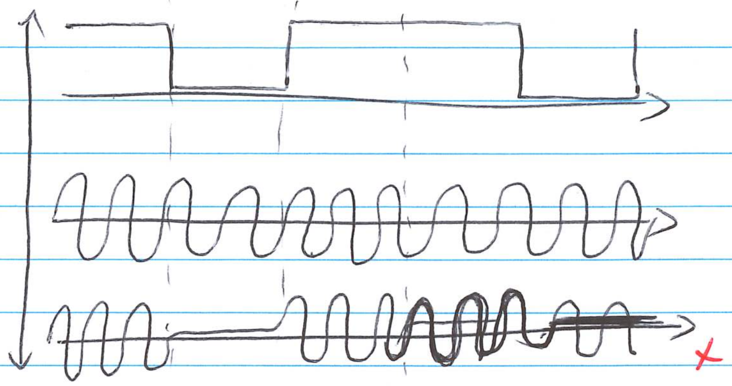
$= 12.98$

1

①

Question ~~9~~A9.

FSk



Carrier frequency

Modulated signal.

1

Question A5

a) $VSWR = \frac{1 + |\rho_v|}{1 - |\rho_v|} = \frac{|V_i| + |V_R|}{|V_i| - |V_R|}$

$= \frac{10 + 4}{10 - 4}$

$= 2.3$ ✓

2.

$V_L = \bar{V}_i + \bar{V}_R \quad = 10 + 4$

$= 14.$

$\frac{V_R}{V_I}.$

Question A10.

50Ω transmission Line

120 + j60Ω.

$\rho_v = \frac{V_r}{V_i}$, $\rho_v = \frac{Z_L - Z_0}{Z_L + Z_0}$ 1

$= \frac{120 - j60 + j0}{120 + j60 - j0}$

1

4

④

Question A4.

$m = \frac{V_{Modulation}}{V_{carrier}} = \frac{250 \times}{4}$

$= 62.5$

Question 2.

a) $DR = 20\log_{10}(N)$. = 1024.

$q = \frac{\text{Voltage Range}}{N}$

$= \frac{32}{1024}$. $= 3.2$.

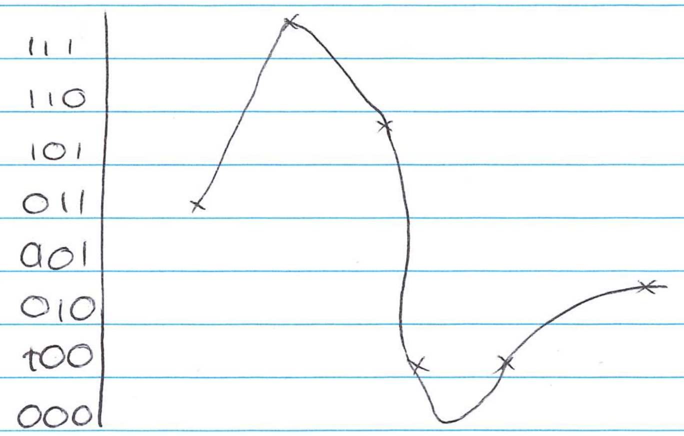
~~VQ~~ $V_{QN} = \frac{q}{\sqrt{12}} = \frac{3.2}{\sqrt{12}} = 0.9238$ ✓ CE.

$SQNR = \frac{\text{rms signal Voltage}}{V_{QN}}$

$= \frac{4.7}{0.9238}$ $= 5.0877$. ✓ CE.

4.

e.)



1

5

⑤