



General Certificate of Education (A-level)
June 2011

Electronics

ELEC5

(Specification 2430)

Unit 5: Communications Systems

Final

Mark Scheme

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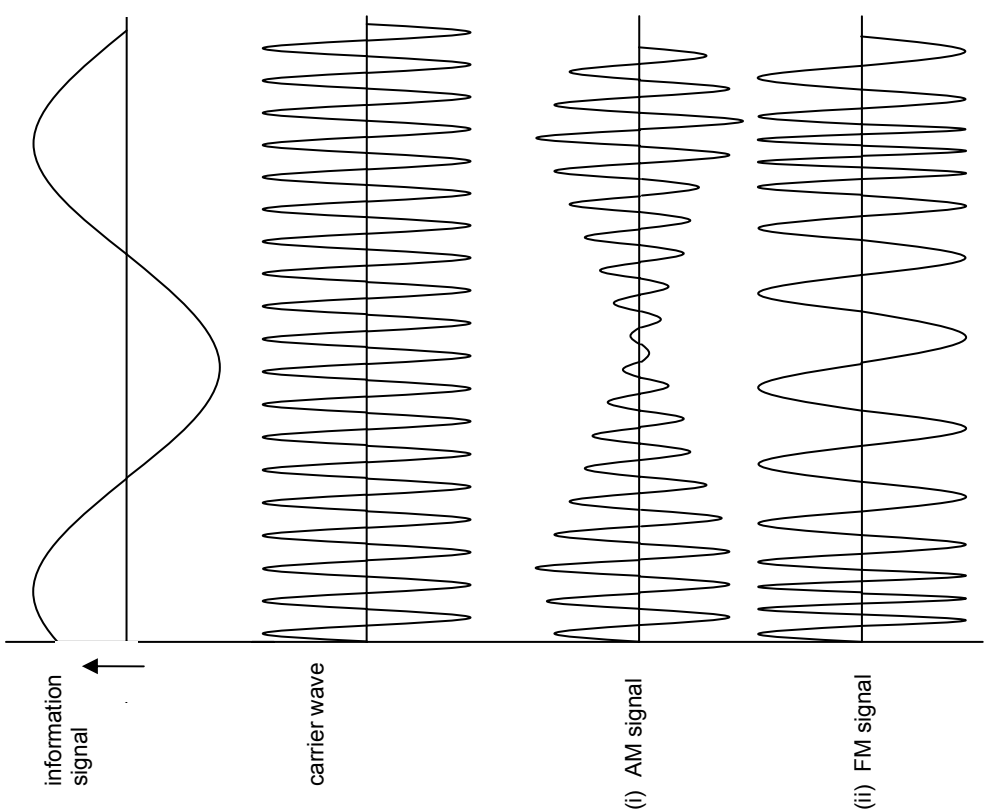
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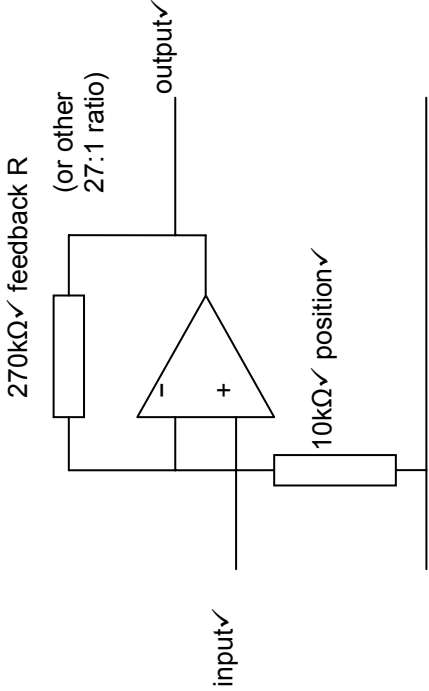
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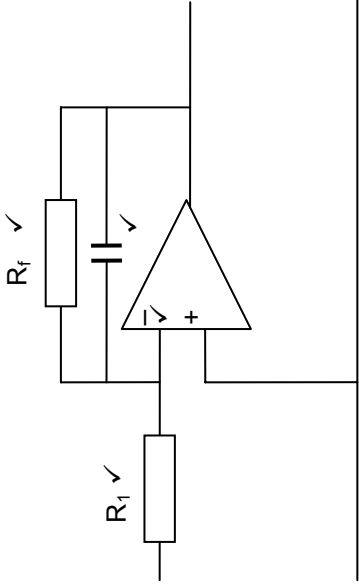
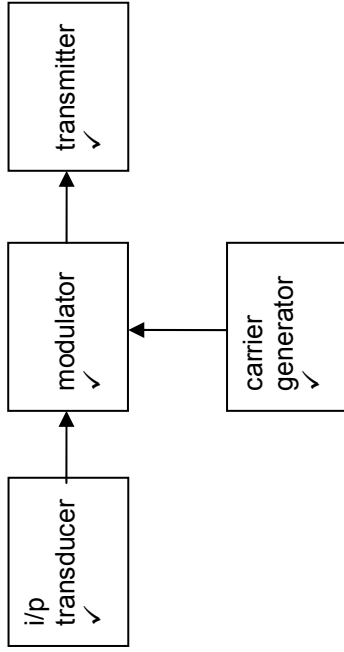
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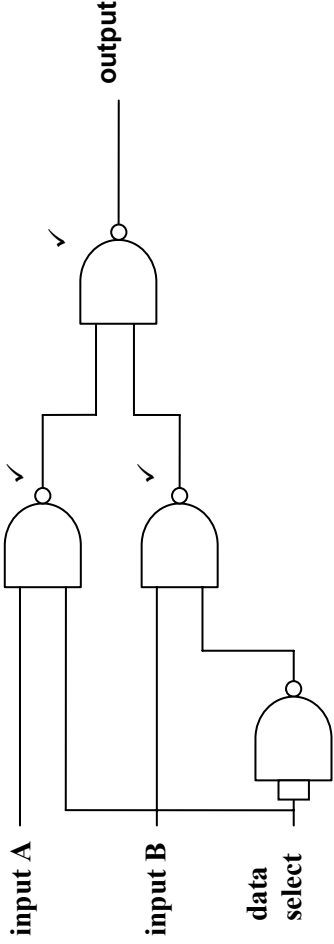
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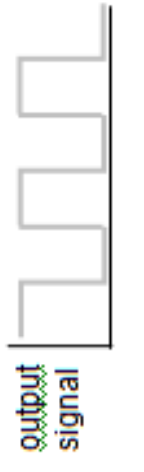
Question	Part	Subpart	Marking guidance		Mark
1	(a)		Antenna or aerial✓ → tuned circuit✓ → detector✓ → af amplifier✓ → loudspeaker✓		5
1	(b)	(i)	detector✓		1
1	(b)	(ii)	tuned circuit✓		1
1	(b)	(iii)	loudspeaker✓		1
1	(b)	(iv)	af amplifier✓		1
1	(c)		obtains af signal from modulated wave OR rectifies modulated carrier wave filters out rf signal passes af signal	Max 2 ✓✓	2

2	(a)		6
2	(b)	(i) $2 \times 3 \text{ kHz} = 6\text{kHz}✓$	1
2	(b)	(ii) $2(3 + 5)✓ = 16\text{kHz}✓$	2

3	(a)	(i)	so it does not load the demodulator✓			1
3	(a)	(ii)	non-inverting amplifier✓			1
3	(a)	(iii)				5
3	(a)	(iv)	$10\text{mV} \times 28 = 280\text{mV} \checkmark$			2
3	(b)		$(1 \times 10^6) \div 28 = 35.7\text{kHz} \checkmark$ suitable for audio sigs (max 20kHz) ✓			3
3	(c)		push-pull source follower diagram✓ correct n channel symbol upper✓ correct p channel symbol lower✓ diode/resistor biasing ✓			4
4	(a)		to prevent aliasing (or description of the effects of aliasing)✓			1
4	(b)		$256 \div 8 \div 2 \checkmark = 16\text{kHz} \checkmark$			2

4	(c)				4
4	(d)	$C = 1 \div (2 \pi R f) \checkmark$ $= 1 \div (6.28 \times 1.5 \times 10^4 \times 1.6 \times 10^4) \checkmark$ $= 663 \text{pF} \checkmark$			3
5	(a)				4
5	(b)	(i)	carrier generator		1

5	(b)	(ii)	use of $f = 1 \div 2\pi \sqrt{LC}$ ✓ $1 \div 2\pi \sqrt{10^{-7} \times 5 \times 10^{-12}}$ ✓ 225 MHz ✓			3
5	(c)		calc leading to $\lambda = 1.32\text{m}$ ✓ $1.33 \div 2 = 0.66\text{m}$ ✓			2
6	(a)		several signals ✓ being sent one after the other in time (or diagram) ✓			2
6	(b)					3
6	(c)		data input to first D input ✓ clock to all clock inputs in parallel ✓ all Q's to following D input ✓ all Q's as parallel outputs ✓			4
7	(a)	(i)	to check whether data has been corrupted ✓			1
7	(a)	(ii)	to specify to where the data is to be sent ✓			1
7	(a)	(iii)	2 of source address, length of data, protocol used, (packet number, total number of packets, time etc.) ✓ ✓			2

7	(b)	(i)	routed via another machine some explanation, e.g. C-D or CE, tries another of its links, etc. ✓			1
7	(b)	(ii)	B sends request to A to retransmit packet✓			1
7	(c)		e.g. better use of bandwidth, allows multiplexing, data often occurs in short bursts, security ✓			1
8	(a)	(i)	LED or laser diode✓			1
8	(a)	(ii)	photo diode✓			1
8	(b)	(i)				1
8	(b)	(ii)	any two from absorption, radiation or scattering✓✓			2
8	(c)	(i)				1
8	(c)	(ii)	signals of different frequencies travelling at different velocities along the fibre✓ Multipath dispersion✓			2

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