Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

(a) Numerical value for capacitor = 6.9 pF ✔

Substitution of values into formula alone – not sufficient for mark.

1

(b) Y and X most suitable / (W and Z out of range) ✔

Y better than X as value falls within centre of range. ✔

implied choice – 1 mark
reason – 1 mark

2

(c) Evidence of reading at 0.7 V_{max} (350 mV) ✔

Bandwidth 20 kHz ✔ Allow range (19–21 kHz)

1 mark only for:
Evidence of reading at 0.5 V_{max} (250 mV)
Bandwidth 25 kHz ✔ Allow range (24–26 kHz)

2

(d) $Q = f_0 / f_B$ = 198 kHz / 20 kHz = 9.9 ✔

Allow ecf from (c)

1

(e) **Either:**

Listener hears overlapping stations - due to increase in bandwidth. ✔

Or

Listener hears station more faintly - due to energy loss / wider energy distribution ✔

Accept S/N argument as weaker stations become more prominent and can be considered as noise.

1

[7]

Q2.

(a) Audio range (bandwidth) is 20 kHz ✔

The sampling frequency should be at least **twice** the maximum frequency / bandwidth ✔

Reference to Nyquist theorem without reference to numerical data – 1

mark only

2

(b) 6.5536×10^4

Allow other correct numbers
eg 65536

1

(c) For one channel:

$44.1 \times 10^3 \times 16 \times 3.5 \times 60 = 148.175$ megabits. ✔

For Stereo:

(2 x 148.175) ÷ 8 = 37.04 megabytes ✔
(Accept 37 megabytes)

***Two** marks for 37 megabytes with no working shown.*

2

(d) Lower quality music over telephone line due to: telephone call has lower bandwidth than original audio file ✔
loss of high and low frequencies from music ✔

***One** mark for general comment relating to ratio of bandwidths of the two systems where CD bandwidth has been taken to be in region of 15 kHz – 20 kHz*

2

[7]

Q3.

The mark scheme gives some guidance as to what statements are expected to be seen in a 1 or 2 mark (L1), 3 or 4 mark (L2) and 5 or 6 mark (L3) answer. Guidance provided in section 3.10 of the 'Mark Scheme Instructions' document should be used to assist in marking this question.

Level	Criteria
L3 **6 marks**	The candidate shows a good knowledge of the **three** general properties of copper wire and optic fibre. They use technical terms correctly, the answer has structure and clearly conveys the information required. They reach a conclusion based on the supporting evidence.
L3 **5 marks**	The candidate shows a good knowledge of the **three** general properties of copper wire and optic fibre. However, there may be minor gaps in knowledge OR the style / structure may lead to a lack of clarity in some of the information being presented. There is a supported conclusion.
L2 **4 marks**	The candidate shows a good understanding of **two** general properties of copper wire and optic fibre. Technical terms will be used correctly and the information will generally be presented in a structured and coherent manner. A conclusion will be drawn from the information presented.
L2 **3 marks**	The candidate shows a good knowledge of **two** general properties of copper wire and optic fibre. There may be minor gaps in knowledge / detail which may lead to a lack of clarity. There will be a conclusion which draws

	some support from the information presented.
L1 **2 marks**	The candidate shows some knowledge of **two** general properties of copper wire and optic fibre. There may be significant gaps in knowledge / detail which may lead to a lack of clarity. There may be no supported conclusion.
L1 **1 marks**	The candidate shows some understanding of **one** of the general properties of copper wire and optic fibre. Overall, this will be a limited answer with significant detail missing. There may be a lack of structure and clarity.
L1 **0 marks**	The work contains no significant analysis of the question asked.

		Copper	**Optic fibre**
Physical	**Corrosion**	Will corrode unless well protected	Glass doesn't corrode
	Weight / connectivity	Heavier, easier to join	Lightweight, more difficult to join sections
External interference	**Security**	Can be tapped without breaking cable	Cannot be tapped unless broken into
	External access	Can pick up noise / cross talk	Immune from noise – can be used in noisy environments
Signal-carrying properties	**Signal degradation / attenuation**	High attenuation	Low attenuation / Possible pulse smearing
	Bandwidth / info carrying capacity	Relatively low bandwidth / fewer channels	Greater bandwidth / capacity / more channels / possibility of sending multiple types of signal eg data + talk

[6]