Practice Question Set For A-Level
Subject : Physics
Paper-3 Topic: Section B (Section 13_ Electronics)

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Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

(a) high input impedance
very large voltage gain any two **(1) (1)**
low output impedance

2

(b) (i) circuit diagram to show: correct feedback and output **(1)**
correct inputs **(1)**

(ii) $R_a \geq 1$ kΩ **(1)**
gives $R_f = 150$ kΩ **(1)**

4

(c) (i) fraction of output fed back through R_f **(1)**
is 180° out of phase with input **(1)**

(ii) increased stability or less distortion or controlled gain **(1)**

(iii) range of frequencies within which voltage gain
does not fall by 1 / √2 or power by 1 / 2 **(1)**

(iv) bandwidth given by gain of $\frac{22}{\sqrt{2}}$ = 16 **(1)** (15.6)

horizontal line at gain = 16 and inside curve

max 5

[11]

Q2.

(a) (i) (use of $X_C = \frac{1}{2\pi fC}$ gives)

$$f = \left(\frac{1}{2\pi X_C C}\right) = \frac{1}{2\pi 1000 \times (0.01 \times 10^{-6})} = 16 \times 10^4 \text{Hz}$$ **(1)**

(ii) $\left(X_C = \frac{1}{2\pi fC}\right)$ low f gives high X_C **(1)**

X_C >> resistance 1.0 kΩ **(1)**

V_{out} (= IR) or $\frac{V_{out}}{V_{in}}$ is low **(1)**

(or correct usage of potentiometer equation)

4

(b) (shown in (i) that at low f, $\frac{V_{\text{out}}}{V_{\text{in}}}$ is low)

as f increases, X_C decreases and V_{out} (across R) increases **(1)**
until ≈ 0 V across X_C and $V_{\text{out}} = V_{\text{in}}$ **(1)**

2

[6]