Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) (i) (use of $G = -\frac{R_f}{R_a}$ gives) $G = -\frac{300(k\Omega)}{30(k\Omega)}$ **(1)**

= - 10 **(1)**

(ii) waveform to be:
sinusoidal with same frequency as input waveform **(1)**
inverted with respect to input waveform **(1)**
peak value of ± ≈ 10 V **(1)**
(allow C.E. for incorrect value of G from (i))

5

(b) waveform to be:
clipped **(1)**
at ≈ ±15 V **(1)**

2

[7]

Q2.

(a) voltage at A = $\frac{12 \times 8}{18}$ **(1)** = 5.3 V

voltage at B = $\frac{12 \times 14}{18}$ = 9.3 V **(1)**

(3)

(b) (i) for op-amp. 1, $V_+ > V_-$ **(1)**
∴output (saturated) at +12 V, ∴ P is lit **(1)**

(ii) for op-amp. 2, $V_- > V_+$ **(1)**
∴ output (saturated) at –12 V, ∴Q is unlit **(1)**

(4)

(c) for P, $V = IR$ gives 12 – 1.6 = $20 \times 10^{-3} \times R$ **(1)**
R = 520 Ω **(1)**

(2)

[9]

Q3.

(a) (i) negative feedback: part or all of the output is fed back to the input
180° out of phase **(1)**

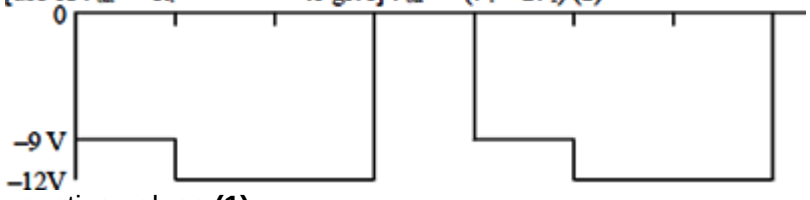
achieved through R_f **(1)**

(ii) greater stability
less distortion any two **(1) (1)**
increased bandwidth
gain predictable

4

(b)

[use of $V_{out} = -R_f\left(\frac{V_1}{R_1} + \frac{V_2}{R_2}\right)$ to give] $V_{out} = -(V_1 + 2V_2)$ **(1)**



negative values **(1)**
correct 9 V and 12 V **(1)**
saturation **(1)**
repeated **(1)**

max 4

[8]