Mark scheme
June 2002

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

GCE

Electronics

Unit ELE5

ELE5 – Communications Systems

1   (a)

antenna	→	tuned circuit	→	detector / demodulator	→	audio amplifier	→	loudspeaker
✓		✓		✓		✓		✓
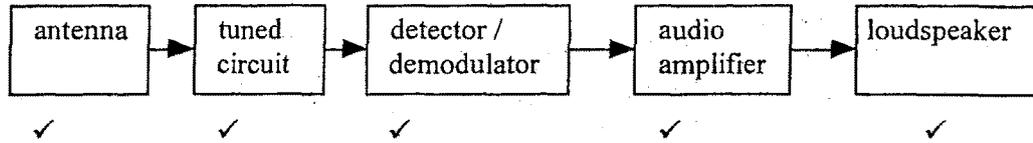
    (b)   (i) $3 \times 10^8 / 1.5 \times 10^6$✓ $= 200$m✓

          (ii)   100m✓

    (c) 50Ω ✓   (total 9)

2   (a)

input transducer	→	modulator	→	antenna
✓		✓		✓

carrier generator
✓

    (b)   (i)

H✓ L✓
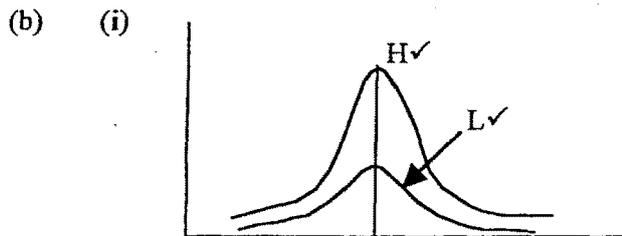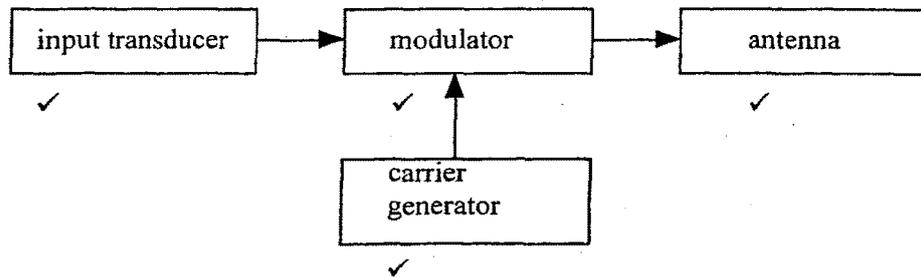
          (ii) $f = 1 / (2 \times 3.14 \, (5 \times 10^{-6} \times 2 \times 10^{-11})0.5)$✓✓
                $=$ 15.92 MHz✓   (total 9)

3   (a)   lower sideband✓   carrier✓   upper sideband✓

    (b)   607.5 - 603✓ $= 4.5$ kHz✓

    (c)   medium wave✓

    (d)   (i)   long wave or short wave✓

          (ii)   VHF✓   (total 8)

4   (a)   non - inverting amplifier✓

        (b)

resistors✓

input✓

output✓
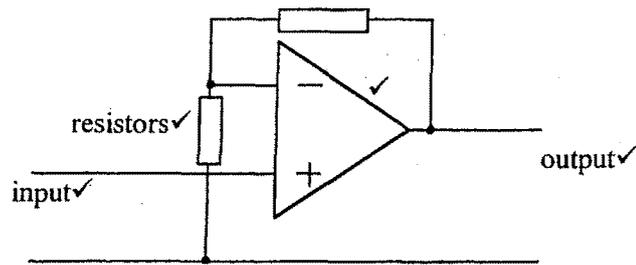
        (c)   values at least in kΩ range✓
                  eg 1k✓ and 39k✓

        (d)   (i)   gain - bandwidth product✓

                  (ii)   at least 25MHz✓   (total 10)

5   (a)

high refractive index✓

low refractive index✓
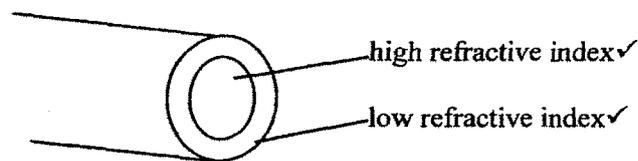
        (b)   total internal reflection✓
                  light hits boundary at an angle greater than critical angle✓
                  and reflects from boundary travelling further along fibre✓

        (c)   (i)   LED or laser diode✓

                  (ii)   photo diode or avalanche diode✓

        (d)   more information carrying capacity✓
                  more secure✓
                  less attenuation✓
                  less interference✓   (any two points)   (total 9)

6   (a)   radio wave✓

        (b)   16 MHz / 16 kHz✓   = 1000 calls✓

        (c)   8 kHz / 2✓   = 4 kHz✓

        (d)   (i)   as logic signals, 1 and 0✓

                  (ii)   PWM✓   PCM✓
                            PPM✓   (total 9)

7   (a)

rf amplifier✓ mixer✓   if amplifier✓

local oscillator✓   agc✓

(b)   (i)   two devices, one for positive half wave,
                  the other for the negative half wave✓

       (ii)   crossover distortion✓
                  biassing devices and / or negative feedback✓

       (iii) $(12 - 2)^2 / 2 \times 4 = 100 / 8$✓ $= 12.5$ W✓

(c)   (i)   0
                  0✓
                  1
                  1✓
                  0
                  1✓
                  0
                  1✓

       (ii)

(total 18)

Paper Total 72

AQA