

Mark scheme for Support Worksheet – Topic F, Worksheet 1

- 1 The modification to a carrier wave so that it can carry information. [1]
- 2 In AM the amplitude of the carrier wave is modified; by the addition of the information wave displacement to the carrier amplitude. [2]
- 3 In FM the amplitude of the carrier stays the same; but the frequency gets modified by an amount related to the information signal displacement. [2]
- 4 The carrier frequency is 50 kHz; the information signal frequency is 5.0 kHz and the bandwidth is 10 kHz. [3]
- 5 $13 = 8 + 4 + 1 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 1101$ [1]
- 6 $1011 = 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 8 + 2 + 1 = 11$ [1]
- 7 Information can be encrypted; digital signals can be perfectly regenerated. [2]
- 8 A way to transmit many different signals along the same transmission line. [1]
- 9 X is an analogue to digital converter; takes in an analogue signal and turns it into a binary word consisting of a specific number of bits; Y is a serial to parallel converter; once all the bits have arrived one after the other along the transmission line, the serial to parallel converter puts these bits into a single binary word. [4]
- 10 The angle of incidence for which the angle of refraction is 90° . [1]
- 11 $n \sin \theta_c = 1.0 \sin 90^\circ$ and so $\theta_c = \sin^{-1} \frac{1}{1.43} = 44.4^\circ$ [1]
- 12 (Dispersion is the general phenomenon in which different rays take different times to arrive at their destination.) Material dispersion is due to different wavelengths having different speeds; whereas modal dispersion is due to rays following different paths in a fibre. [2]
- 13 Attenuation is the loss of power in a signal as it travels in a medium. [1]
- 14 Noise is unwanted power/signal that is present along with the desired signal. [1]
- 15 The main source of noise in an optic fibre is the dark current in the photodiode of the fibre. [1]
- 16 It has infinite resistance between its two inputs; the open loop gain is infinite. [2]
- 17 The output voltage has opposite sign to that of the input voltage. [1]
- 18 Phone sends signal identifying itself; cellular exchange assigns phone to base station where signal is strongest; a frequency is assigned to the phone. [3]
- 19 As the passenger moves, the cellular exchange computers monitor the signal strength and will automatically reroute the call to another base station in a other cell; so that the signal strength is maintained. [2]