

2 Fig. 2.1 shows an optic fibre used for data transmission.

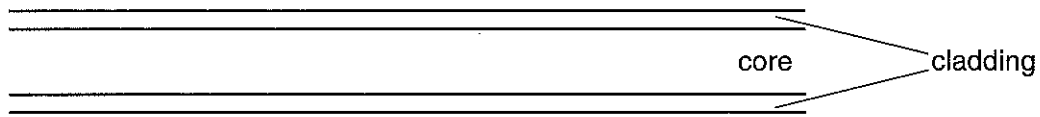


Fig. 2.1

(a) Explain what is meant by *multipath dispersion* in an optic fibre used for data transmission.

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(b) The refractive index of the core is only slightly greater than that of the cladding so that the critical angle for the core-cladding interface is just less than 90° . State and explain how such a large value for the critical angle improves the quality of the data pulses that are received after being transmitted along the fibre.

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[Total: 5]

Question	Expected Answers	Marks	Additional Guidance
2 a	some light takes DIFFERENT PATHS (WTTE) some light ARRIVES at DIFFERENT TIMES (WTTE) hence pulse "smeared"/distorted/corrupted/dispersed/spread out (WTTE)	B1 B1 B1	Do not allow weakened signal
2 b	(large critical angle means) <u>most of the light will be refracted out</u> (WTTE) so most rays follow same path/ rays arrive at same time (WTTE)	M1 A1	Allow 'reduces the amount of TIR'
	Total	5	

Question	Expected Answers	Marks	Additional Guidance
3 a	(a) <u>SPREADING</u> of waves (into a 'shadow region') (WTTE)	B1	Allow plane waves become circular but do not allow bending OR dispersion Ignore diagrams – question says STATE
3 b i	(plane waves) drawn with wavelength 'same' as gap ($0.5a < \lambda < 1.5a$) 'semi-circular' waves drawn (i.e nothing straight) wavelength shown to be constant (or same λ labelled before & after)	B1 B1 B1	
3 b ii	LESS diffraction (WTTE) wavefronts mainly straight/less curved/do not spread into shadow	C1 A1	a good diagram can score full marks OR simply a description of how the waves change scores both marks (i.e C1, A1)
	Total	6	