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Question Paper Code : 73465

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh Semester

Electronics and Communication Engineering

EC 2402/EC 72/10144 EC 702 — OPTICAL COMMUNICATION AND NETWORKING

(Regulations 2008/2010)

(Common to PTEC 2402 – Optical Communication and Networking for B.E. (Part-Time) Sixth Semester – Electronics and Communication Engineering – Regulations 2009)

Time : Three hours

Maximum : 100 marks

Missing data may be suitably assumed.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Calculate the critical angle of incidence between an interface with different refractive indices, where $n_1 = 1.5$ and $n_2 = 1.46$.
2. State Snell's law.
3. What do you mean by polarization dispersion in a fiber?
4. A fibre has an attenuation of 0.5 dB/Km at 1500 nm. If 0.5mW of optical power is initially launched into the fibre, what is the power level in after 25Km?
5. Calculate the band gap energy for an LED to emit 850 nm.
6. Define : Detector response time.
7. For a pin photo diode having operating wavelength of 1300 nm, the quantum efficiency is around 90%. Calculate the responsivity of the photo diode.
8. Define Quantum Limit.
9. Obtain the transmission bit rate of the basic SONET frame in Mbps.
10. Illustrate interchannel cross talk that occurs in a WDM system.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the mode equations for a circular fibre using Maxwell's equations. (8)
- (ii) Calculate the Numerical Apertures of a fibre having $n_1 = 1.6$ and $n_2 = 1.49$ and another fibre having $n_1 = 1.458$ and $n_2 = 1.405$. Which fibre has greater Acceptance angle? (8)
- Or
- (b) (i) Explain the ray theory of a fibre with a special mention about TIR, Acceptance angle and NA. (8)
- (ii) Describe Single mode fibres and their mode – field diameter. What are the propagation modes in them? (8)
12. (a) What are the loss or signal attenuation mechanisms in a fiber? Explain. (8)
- Or
- (b) (i) Discuss in detail about fiber splicing. (10)
- (ii) What are the primary requirements of a good fiber connector design? (6)
13. (a) (i) Draw and explain double hetero-structure light emitter with energy band diagram and refractive index profile. (6)
- (ii) Why is the double hetero-structure preferred for optical fiber communication? Justify your answer. (3)
- (iii) Derive with relevant mathematical expression of optical power emitted from LED. (7)
- Or
- (b) Discuss various noise sources available in APD and also derive the expression for the optimum gain at maximum signal to noise ratio. (16)
14. (a) Derive the probability of error of fiber optic receiver. (16)
- Or
- (b) Explain how attenuation and dispersion measurements could be done. (16)
15. (a) (i) What is a 'four-fiber BLSR' ring in a SONET? Explain the reconfiguration of the same during node or fiber failure. (8)
- (ii) What is 'broadcast-and-select multihop network'? Explain. (8)
- Or
- (b) (i) Explain the following requirements for the design of an optically amplified WDM link :
- (1) Link Band width
- (2) Optical power requirements for a specific BER. (8)
- (ii) Write a note on solitons. (8)