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Question Paper Code : 40402

M.E./M.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

First Semester

Communication Systems

CU 5192 — OPTICAL NETWORKS

(Common to Communication and Networking and Electronics and Communication Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the advantages of optical fiber communication.
2. Draw the history of attenuation which shows the evolution of optical communication.
3. Define power penalty in optical networks.
4. Draw the switch fabric of an optical cross connect.
5. Determine the fiber length to delay the packet by one slot.
6. Mention the features of SONET.
7. Distinguish between dense WDM and coarse WDM.
8. What is the function of add/drop multiplexer?
9. Compare and contrast of multi protocol label switching with multi protocol lambda switching.
10. Name some of the protection techniques used in second generation optical networks.

PART B — (5 × 13 = 65 marks)

11. (a) With example explain different types of layered hierarchy applied to optical networks. (13)

Or

(b) Write in brief about the non linear effects of optical communication systems at higher bit rates. (13)

12. (a) (i) Discuss in detail about the overall design considerations for fiber optic system deployment. (8)

(ii) A step index multimode fiber with a numerical aperture of 0.20 supports approximately 1000 modes at an 850 nm wavelength. What is the diameter of its core? How many modes does the fiber support at 1320 nm. (5)

Or

(b) Narrate various techniques used for implementing IP over optical networks. (13)

13. (a) (i) Draw the layered architecture of OTN hierarchy. (6)

(ii) Formulate the generic frame structure to facilitate interoperability of equipments among different vendors. (7)

Or

(b) Assume that 25000 voice channels multiplexed in D-1 format are mapped into OC-192 stream. How many ATM streams at 149.76 MB/s can be transmitted by the network in addition to the voice channels? Once maximum possible number of ATM 149.76 Mbps stream is added, find how many additional voice channels can be added to the OC-192 stream using SONET multiplexing. (13)

14. (a) (i) Discuss the principle of operation of Erbium doped fiber amplifier. (6)

(ii) Compare OTDM, FDM and WDM. (7)

Or

(b) Illustrate different types of wavelength assignment technique with an example. (13)

15. (a) (i) Discuss the significance of performance attributes and fault mechanism of an optical communication network with suitable example. (7)

(ii) Show different methods of protecting a WDM mesh network against node failure and link failure. (6)

Or

(b) (i) How does MPLS work with IP based network? (7)

(ii) Mention various applications of MPLS paradigm in IP network. (6)

PART C — (1 × 15 = 15 marks)

16. (a) In InGaAsP laser operating at 1500 nm has dimensions d = 600 nm, w = 1200 nm, L = 0.5 mm. The absorption coefficient α = 500 m^{-1} spontaneous emission life time τ_{sp} = 4 ns; refractive index n = 3.5; threshold current density $J_{th} = 2 \times 10^6$ A/m^2. (15)

(i) Calculate the photon lifetime τ_{ph}.

(ii) Calculate the number of emitted steady state photons, when the current density J is 3×10^6 A/m^2.

(iii) Calculate the internal optical power density P_{int} in mW/m^2.

Or

(b) Construct a scheme to multiplex N user's data in a using bit interleaving method and de-multiplex the same with necessary block diagram. (15)

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