

AMIE STUDY CIRCLE, ROORKEE

# MODEL TEST PAPER FOR AMIE EXAMS



**OPTICAL & SATELLITE  
COMMUNICATIONS**

**TEST PAPER 1**



**+91-9412903929**



**INFO@AMIESTUDYCIRCLE.COM**



**CITY PRIDE COMPLEX, NR IIT CAMPUS,  
ROORKEE**



**AMIESTUDYCIRCLE.COM**

**OPTICAL & SATELLITE COMMUNICATIONS***Time: Three Hours**Maximum Marks: 100*

*Answer five questions, taking ANY TWO from Group A, any two from Group B and all from Group C.*

*All parts of a question (a, b, etc. ) should be answered at one place.*

*Answer should be brief and to-the-point and be supplemented with neat sketches.*

*Unnecessary long answer may result in loss of marks.*

*Any missing or wrong data may be assumed suitably giving proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) What are the major problems encountered in the early development of optical communication for the practical use? Explain. 6
- (b) What are the different fiber materials used in optical communication? Explain. 6
- (c) What is the difference between a connector and a splice? Explain with neat sketch the fusion splicing technique and expanded beam connector for fiber coupling. What are the requirements of a good connector? 8
  
2. (a) An 8 x 8 star coupler is used in a fiber optic system to connect the signal from one computer to eight terminals. If the power at an input fiber to the star coupler is 0.5 mW, find (i) the power at each output fiber (ii) the power division in decibels. 8
- (b) A communication system uses 10 km of fiber that has a 2.5 dB/km loss characteristic. Find the output power if the input power is 400 mW. 6
- (c) What are the advantages and disadvantages of Light Emitting Diode (LED) optical source? Derive expression for coupling efficiency of LED. 6
  
3. (a) Discuss the optical feedback in Fabry-Perot laser and explain its amplification mechanism. Derive expression for threshold gain of Fabry-Perot laser to ensure amplification. The longitudinal modes of GaAs 8

- injection laser emitting at a wavelength of  $0.87 \mu\text{m}$  are separated in frequency by 278 GHz. Determine the length of the optical cavity and number of longitudinal modes. The refractive index of GaAs is 3.6.
- (b) With neat diagram explain the principle of A/O and E/O modulators. 6  
Analog to optical (A/O) and electronic to optical E/O modulators.
- (c) Explain the concept of digital optical fiber link with diagram. 6
4. (a) An acousto-optic modulator is used to modulate a laser beam of wavelength 850 nm. If the acoustic wave length is  $4.4 \times 10^{-5}$  m, calculate the Bragg angle of the modulator. 8
- (b) Explain the features of LAN, MAN and WAN. Compare their parameters. 6
- (c) Explain the function of the elements OLT and ONU in GPON and show how the traffic flows in downstream and upstream time division multiple access. 6

**Group B**

5. (a) Explain the working of a satellite transponder with the help of block diagram. 8
- (b) Explain any two satellite subsystems with the help of neat block diagram. 6
- (c) Differentiate between crossed drooping dipole antenna and microstrip patch antenna. 6
6. (a) Discuss in detail about attitude control of a satellite. What is the chief advantage of the TWTA used aboard satellite compared to other types of high power amplifiers. 8
- (b) What is the frame efficiency of a TDMA system? With the help of structure define the TDMA super frame and explain how it differs from a simple TDMA frame. 6
- (c) Draw a neat block diagram of GPS receiver and explain the function of each component involved in it. What is differential GPS? 6
7. (a) Explain the working of a satellite transponder with the help of block diagram. 10

- (b) How do uplink and downlink frequencies differ? Explain. Why specifically 10 6 GHz is used for uplink and 4 GHz as downlink? 10
8. (a) Explain the calculation of a combined uplink and downlink C/N ratio. Or, 10  
derive expression for carrier to noise ratio in a complete link design.
- (b) What is system noise temperature? How does it affect the C/N and G/T 10  
ratio?

**Group C**

9. Answer the following in brief: 20
- (i) Define optical receiver sensitivity and give its units also.
  - (ii) Define spectral efficiency of WDM optical communication system.
  - (iii) Differentiate between active and passive satellite in short.
  - (iv) Why uplink frequency is higher than downlink frequency?
  - (v) What are the applications of VSAT network?
  - (vi) What are Azimuth and elevation angles?
  - (vii) Differentiate between meridional ray and skew ray.
  - (viii) Define LP Modes.
  - (ix) What do you mean by dispersion Flattened fiber?
  - (x) What do you mean by dispersion shifted fiber?

*(Refer our course material for answers)*