



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

**B.Tech V SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2022**

**Regulation:UG20**

**CELLULAR AND MOBILE COMMUNICATIONS**

**Time: 3 Hours (ELECTRONICS AND COMMUNICATION ENGINEERING) Max Marks: 70**

**Answer ALL questions in Module I and II**

**Answer ONE out of two questions in Modules III, IV and V**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

## MODULE – I

- (a) Explain the different components of the cellular system. Discuss the performance criteria of cellular system [BL: Understand| CO: 1|Marks: 7]

(b) The coverage area of a cellular system is 2000sq km with each cell having a radii of 5sq km, and there are a total of 1000 radio channels available for handling the traffic. Calculate the system capacity for 7 cell reuse. [BL: Apply| CO: 1|Marks: 7]

## MODULE – II

- (a) Explain co-channel interference in a cellular system and discuss the methods to reduce the co-channel interference. [BL: Understand| CO: 2|Marks: 7]

(b) If a transmitter produces 50 watts of power is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100 m from the antenna, What is received power at 10 km? Assume unity gain for the receiver antenna. [BL: Apply| CO: 2|Marks: 7]

## MODULE – III

- (a) Describe a two – ray ground reflection model with a neat sketch. Determine the expression for path difference and phase difference for two-rays between the transmit antenna and receive antenna. [BL: Understand| CO: 3|Marks: 7]

(b) A transmitting antenna in a cellular communication with 10W, transmits a RF signal for a distance of 1km. The wavelength of the signal transmitted is 0.333 m. The gains of both transmitting and receiving antenna are unity respectively. Find the received power. [BL: Apply| CO: 3|Marks: 7]
- (a) Illustrate the concept of cell splitting in cellular system. Deduce the relationship between the received powers of the old cell and new cell. [BL: Understand| CO: 4|Marks: 7]

(b) A cell phone subscriber makes a call with a request rate of 0.3 calls/hour. The average duration of call is found to be 0.5 hour. Determine

  - Traffic intensity
  - Total offered load, if the number of users in the given cell is 20. [BL: Apply| CO: 4|Marks: 7]

## MODULE – IV

5. (a) List out the three types of dedicated control channels in GSM. Explain the essential features of 4G digital cellular system. [BL: Understand| CO: 5|Marks: 7]
- (b) A recorded conversation is to be transmitted by a QPSK Direct Sequence Spread Spectrum System (DS/SSS). Assuming the spectrum of the speech waveform is bandlimited to 4 kHz, and that a 128-level quantizer is used: i) find the chip rate required to obtain a processing gain of 20 dB; ii) Given that the sequence length is to be greater than 5 hours, find the number of shift register stages required. [BL: Apply| CO: 5|Marks: 7]
6. (a) What is the information superhighway? With a block diagram, explain an information super highway. [BL: Understand| CO: 5|Marks: 7]
- (b) If GSM uses a frame structure where each frame consists of S time slots, and each time slot contains 156.25 bits, and data is transmitted at 270.833 kbps in the channel, find
- i) The time duration of a bit, slot and frame
- ii) How long must a user occupying a single time slot must wait between two simultaneous [BL: Apply| CO: 5|Marks: 7]

## MODULE – V

7. (a) Discuss about asynchronous transfer mode technology and types of transfer mode technologies with example. [BL: Understand| CO: 6|Marks: 7]
- (b) It is required to transmit a data at a rate of 64kbps over a 3 kHz telephone channel. What is the minimum SNR required to accomplish this? [BL: Apply| CO: 6|Marks: 7]
8. (a) What is SS7 network? Explain about SS7 network and ISDN for AIN. Distinguish between ISDN for AIN. [BL: Understand| CO: 6|Marks: 7]
- (b) Calculate the required bandwidth, if in a communication channel the signal power is 100 W and noise power is 10 W and the information transmission rate is 10kbps [BL: Apply| CO: 6|Marks: 7]

