



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech V SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024

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

1. (a) Summarize the following terms in connection with the cellular radio system
  - i) Control channel and voice channel types
  - ii) Frequency division duplexing
  - iii) Duplexer
  - iv) Time division duplexing

[BL: Understand| CO: 1|Marks: 7]
- (b) If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 25 kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses
  - i) 4-cell reuse
  - ii) 7-cell reuse
  - iii) 12-cell reuse.

[BL: Apply| CO: 1|Marks: 7]

## MODULE – II

2. (a) What are co-channel cells? Explain a co-channel interference and system capacity. Write the expression for signal to interference ratio.

[BL: Understand| CO: 2|Marks: 7]
- (b) If a transmitter produces 50 watts of power 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

3. (a) With a neat diagram explain a two – ray ground reflection model. Derive 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 antennae are unity respectively. Find the received power.

[BL: Apply| CO: 3|Marks: 7]
4. (a) List various types of hand-off techniques used in cellular system. Why queuing of hand-off is necessary?

[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) Classify different classes of signaling connection control part (SCCP) of SS7. Explain the essential features of 2G digital cellular system. [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 the
- Time duration of a bit
  - Time duration of a slot
  - Time duration of a frame
  - How long must a user occupying a single time slot must wait between two simultaneous transmissions. [BL: Apply| CO: 5|Marks: 7].
6. (a) Mention the salient features of message transfer part (MTP) of SS7 system. Explain the GSM architecture with a block diagram. [BL: Understand| CO: 5|Marks: 7]
- (b) What is the theoretical maximum data rate that can be supported in a 200 kHz channel for SNR of 10dB and 30 dB with the GSM standard. If the GSM data rate is 270.8 kbps, find the percentage data rate with 10dB SNR. [BL: Apply| CO: 5|Marks: 7]

#### MODULE – V

7. (a) What type of packet switching is used to handle both voice and data in a single channel? Explain its cell format. [BL: Understand| CO: 6|Marks: 7]
- (b) Infer about future public land mobile telecommunication system. Distinguish between ISDN and AIN. [BL: Understand| CO: 6|Marks: 7]
8. (a) Write about information superhighway. Illustrate the various blocks of an information super highway with the help of diagram. [BL: Understand| CO: 6|Marks: 7]
- (b) Discuss a descriptive note on software defined radio under IMT-2000. List the essential features of personal communication system (PCS). [BL: Understand| CO: 6|Marks: 7]

– ○ ○ ○ ○ –