Name: **Enrolment No:**	

UPES

End Semester Examination, December 2023

Course: Wireless Communication **Semester: V**

Program: B. Tech **Time: 03 hrs.**

Course Code: ECEG-3062 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q. 1	Define the channel assignment in cellular systems and elaborate on the various types of channel assignment.	**4**	**CO1**
Q. 2	Explain the concept of cell splitting and examine its implications on system design	**4**	**CO2**
Q. 3	Determine the distance from the nearest co-channel cell for a cell having a radius of 0.5 km and a cochannel reuse factor of 12.	**4**	**CO2**
Q. 4	Create a comparative analysis of GSM, UMTS, and LTE within cellular systems, emphasizing their distinctions and essential characteristic.	**4**	**CO2**
Q. 5	Differentiate between TDMA and FDMA. Outline the key features of FDMA. List out the advantages and disadvantages of it.	**4**	**CO1**
SECTION B **(4Qx10M= 40 Marks)**			
Q. 6	(a)Discuss Space division multiple access. How it will increase the spectral efficiency as compared with FDMA, TDMA and CDMA. (b) Consider Global System for Mobile, which is a TDMA/FDD system that uses 25 MHz band for the forward link, which is divided into radio channels of 200 kHz each. If 8 speech channels (time slots) are supported on a single radio channel, find the number of simultaneous subscribers that can be accommodated in GSM, assuming no guard band. or (a) Define apogee and perigee height in terms of a satellite revolving around an orbit. (b) Consider the case where a TDMA uses a frame structure where each frame consists of 8 time slots, and each time slot contains 156.25 bits, and data is transmitted at 270.833 kbps in the channel, find (a) the time	**5+5**	**CO3**

	duration of a bit, (b) the time duration of a slot, (c) the time duration of a frame, and (d) how long must a user occupying a single time slot must wait between two simultaneous transmissions.		
Q. 7	(a) Discuss the GSM radio subsystem, and describe the GSM frame structure for normal burst. Differentiate between GSM frame, multi frame and super frame. (b) Define the concept of cell splitting and evaluate its impact on system design.	**5+5**	**CO2**
Q. 8	(a) Explain the significance of handoff procedures in cellular systems, emphasizing their role in ensuring uninterrupted mobile communication. Discuss the various types of handoffs and the precise conditions that prompt a handoff. (b) Provide an in-depth examination of the satellite communication subsystem, and include a block diagram classification of transponders subsystem.	**5+5**	**CO2**
Q. 9	(a)Assume a cellular system of 32 cells with a cell radius of 1.6 km, a total spectrum allocation that supports 336 traffic channels, and a reuse pattern of 7. Calculate the total service area covered with this configuration, the number of channels per cell, and a total system capacity. Assume regular hexagonal cellular topology. (b) If the cell size be reduced to the extent that the same area as covered in Part (a) with 128 cells. Find the radius of the new cell, and new system capacity. Comment on the results obtained.	**10**	**CO2**
SECTION-C (2Qx20M=40 Marks)			
Q. 10	(a) Define Kepler's three laws of planetary motion and demonstrate their applicability to artificial satellites orbiting the Earth in each of three cases. (b) With what velocity should a satellite be revolving at a height of 600 km above the surface of the Earth to move in a circular path? Given: $G = 6.67 \times 10^{-11}$ Nm^2/kg^2, radius of earth = 6.4×10^6 m, Mass of the earth = 5.98×10^{24} Kg.	**10+10**	**CO3**
Q. 11	Determine Calculate the C/I (signal-to-cochannel interference ratio) for the mobile receiver situated at the periphery of its omnidirectional operating cell, and the receiver experiences interference from six cochannel interfering cells within the first tier of a cellular system's design under these three conditions. (a) K = 7, (b) K = 9 and (c) K = 12 Assume the path-loss exponent is 4. What would be the correct choice of K for a system requiring C/I = 18 dB?	**20**	**CO4**