Time: 3 hours **Max. Marks: 80**

N.B. : (1) Question No.1 is compulsory
(2) Write any three questions from Q. 2 to Q.6.
(3) Draw a neat diagrams wherever necessary.

Q1		**Solve any five**	
	a	Draw GSM Network Architecture and explain the use of the following: 1) Home location register (HLR) 2) Visitor location register (VLR) 3) Equipment Identity register (EIR) and 4) Authentication center (AUC)	**4**
	b	Determine the maximum speed of a vehicle in a mobile communication system experiencing a maximum Doppler frequency shift of 70 Hz and a frequency of transmission 900 MHz.	**4**
	c	Explain why OFDMA is preferred for downlink and SC-FDMA for uplink in LTE	**4**
	d	List the features of 5G	**4**
	e	What is Cognitive Radio? State its adavantages	**4**
	f	List the various types of handoffs. Explain Mobile assisted handoff, soft handoff and hard handoff.	**4**
Q2	**a**	Explain Orthogonal Frequency Division Multiple Access (OFDMA) with neat diagrams. Also state its adavantages and drawbacks.	**10**
	b	In a cellular system with frequency reuse distance of 7 and the mobile receiver located at the boundary of its operating cell, under the influence of interfering cells in the first tier. Compute the S/I ratio at mobile receiver for: i) omnidirectional antenna design ii) 3 sector 120^{o} directional antenna design iii) iii) 6 sector 60^{o} directional antenna design comment on the effect of sectoring on S/I ratio. Consider path loss exponent of 4.	**10**
Q3	**a**	Explain Traffic Theory with respect to mobile cellular networks	**10**
	b	Compare IS-95, CDMA-2000 and WCDMA	**10**
Q4	**a**	Draw LTE network architecture and Discuss in details.	**10**
	b	Draw a neat diagram of UMTS system architecture and explain in details.	**10**
Q5	**a**	What is MIMO? What are its advantages. Explain MIMO with respect to 4G Technology.	**10**
	b	Consider that a geographical service area of a cellular system is 4200 km^2 . A total of 1001 radio channels are available for handling traffic. Suppose the area of cell is 12 km^2. 1) How many times would the cluster of size 7 have to be replicated in order to cover the entire service area? Calculate the number of channels per cell and the system capacity. 2) If the cluster size is decreased from 7 to 4, then does it result into increase in system capacity? Comment on the results obtained.	**10**
Q6	**a**	Compare 1G, 2G, 3G, 4G and 5G w.r.t speed, applications, bandwidth, spectral efficiency and handoff.	**10**
	b	Explain Friis Free Space Propagation Model. Derive an expression for received power and path loss at a distance ‘d’ from Mobile transmitter using Free space model. State advantages and drawbacks of the Model.	**10**

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