

**Duration: 3hrs**

**[Max Marks: 80]**

- N.B. : (1) Question No 1 is Compulsory.  
 (2) Attempt any three questions out of the remaining five.  
 (3) All questions carry equal marks.  
 (4) Assume suitable data, if required, and state it clearly.  
 (5) Use of Erlang C chart should be allowed, if required.

- 1 Attempt any **FOUR** **[20]**
  - a State the advantages and disadvantages of millimeter wave technology **[5]**
  - b Define : i) Holding time ii) One Erlang iii) Trunking efficiency iv) Grade of Service v) Duplexer **[5]**
  - c Draw and explain rake receiver **[5]**
  - d Draw GPRS architecture and state its radio specifications **[5]**
  - e List the components of SDR and state two applications **[5]**
- 2 a If a signal to interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (a)  $n = 3$  , (b)  $n = 4$  ? Assume that there are 6 co-channels cells in the first tier and all of them are at the same distance from the mobile. Use suitable approximations. **[10]**
  - b Draw UMTS network architecture with interfaces and explain. Give specifications. **[10]**
- 3 a Derive the relation for free space propagation model. State its drawbacks.. **[10]**
  - b Explain power control process in WCDMA **[10]**
- 4 a A hexagonal cell within a 4-cell system has a radius of 1.387 km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs, and  $\lambda = 1$  call/hour, compute the following for an Erlang C system that has a 5% probability of a delayed call: **[10]**
  - (a) How many users per square kilometer will this system support?
  - (b) What is the probability that a delayed call will have to wait for more than 10s?
  - (c) What is the probability that a call will be delayed for more than 10 seconds?
  - b Illustrate 3GPP core network architecture and explain functions of each block in detail. **[10]**
- 5 a Compare 1G, 2G, 3G, 4G, 5G based on technologies used, data rate, frequency band, modulation, architecture, and application. **[10]**
  - b Explain spectrum sensing in cognitive radio. **[10]**
- 6 a Draw 5G network architecture and explain **[10]**
  - b Write a note on (any TWO) **[10]**
    - i) GSM identifiers
    - ii) PAPR in OFDM
    - iii) Multiple antenna techniques in 3GPP LTE