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Roll No. _____

8E 4099

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B.Tech. VIII Semester (Old Back) Examination, May 2016
Electronics Instrumentation & Control Engineering
8EI4.1(O) Wireless Communication

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting one question from **each unit**. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. A ground based air-surveillance radar operates at a frequency of 1300 MHz. (L-band). Its maximum range is 200 nmi for the detection of a target with a radar cross section of one square meter ($\sigma = 1m^2$). Its antenna is 12m wide by 4m high, and the antenna aperture efficiency is $\rho_a = 0.65$. The receiver minimum detectable signal is $S_{min} = 10^{-13}w$. Determine the following
 - i) Antenna effective aperture A_e (square meter) and antenna gain G , where
 $G(dB) = 10 \log_{10} G$ (as a numeric) (3)
 - ii) peak transmitted power (3)
 - iii) Pulse repetition frequency to achieve a maximum unambiguous range of 200 nmi (3)
 - iv) Average transmitted power, if the pulse width is $2 \mu s$ (3)
 - v) Duty cycle (2)
 - vi) Horizontal beamwidth (2)

OR

1. The moon as a radar target may be described as follows. Average distance to the moon is $3.844 \times 10^8 m$. (about 208,000 nmi); experimentally measured radar cross section is $6.64 \times 10^{11} m^2$ (mean value over a range of radar frequencies); and its radius is $1.738 \times 10^6 m$

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- i) What is the round trip time in second of radar pulse to the moon and back (4)
- ii) What should the pulse repetition frequency(prf) be in order to have no range ambiguities (4)
- iii) For the purpose of probing the nature of the moon's surface, a much higher prf could be used than that found in (b). How high could the prf be if the purpose is to observe the echoes from the moon's front half ? (4)
- iv) If an antenna with a diameter of 60ft and aperture efficiency of 0.6 were used at a frequency of 430 MHz. With a receiver having a minimum detectable signal of $1.5 \times 10^{-16} \text{W}$, what peak power is required (4)

Unit - II

2. a) Explain the Kepler's three laws of planetary motion (8)
- b) Explain the following: (4+4=8)
 - i) Elevation angle
 - ii) Azimuth angle

OR

2. Explain all orbital effects in communication system performance (16)

Unit - III

3. Explain all the satellite subsystems with neat diagram (16)

OR

3. Explain the following (8)
 - a) DAMA (8)
 - b) A satellite transponder has a bandwidth of 36 MHz. Earth stations use RRC filters with $\alpha = 0.4$. What is the maximum bit rate that can be sent through this transponder with
 - i) BPSK (4)
 - ii) QPSK (4)

Unit - IV

4. Given a cellular system in which there are a total of 1001 radio channels available for handling traffic. It is also given that the area of a cell is 6km^2 and the area of the entire system is 2100 km^2
 - i) Calculate the system capacity if the cluster size is 7 (4)
 - ii) How many times would the cluster of size 4 have to be replicated in order approximately cover the entire cellular area? (4)
 - iii) Calculate the system capacity if the cluster size is 4 (4)
 - iv) Does decreasing the cluster size increase the system capacity? Explain. (4)

OR

4. Explain:

- a) Adjacent channel Interference (8)
- b) Co-channel Interference (8)

Unit - V

5. a) Compare PCs and cellular telephony in terms of frequency, bandwidth and channel capacity (8)
- b) Explain the personal communication (8)

OR

5. Explain:

- a) Concept of GSM (8)
- b) DECT standard (8)