JHARKHAND UNIVERSITY OF TECHNOLOGY

Diploma 5th Semester Sample Paper (DIPLOMA WALLAH)

MOBILE WIRELESS COMMUNICATION

Time: 3 Hours   **Full Marks: 70**   **SET: 2**

INSTRUCTIONS:
1. Question No. 1 is Compulsory.
2. Answer any **FOUR** questions from the remaining (Q.2 to Q.7).
3. **Note regarding Diagrams:** Where diagrams are required, please refer to standard textbooks or search on Google/YouTube for the specific topic (e.g., "DSSS Block Diagram").

Q.1. Multiple Choice Questions   [2 × 7 = 14]

(i) Which modulation technique is primarily used in GSM?

(a) AM   (b) FM
(c) GMSK   (d) QAM

(ii) The "Near-Far Problem" is a significant issue in which system?

(a) FDMA   (b) TDMA
(c) CDMA   (d) All of the above

(iii) The unit of traffic intensity in a telecommunication system is:

(a) Hertz   (b) Erlang
(c) Decibel   (d) Baud

(iv) In a cellular system, the separation distance (D) and radius (R) are related by the reuse factor (N) as:

(a) $D/R = \sqrt{3N}$ (b) $D/R = 3N$
(c) $D/R = N$ (d) $D/R = \sqrt{N}$

(v) Paging is a technique used to:

(a) Initiate a call   (b) Terminate a call
(c) Locate a subscriber   (d) Transfer data

(vi) Which layer of the OSI model does the WAP (Wireless Application Protocol) mainly interact with?

(a) Physical Layer   (b) Application Layer
(c) Network Layer   (d) Data Link Layer

(vii) The coverage area of a base station is called a:

(a) Cell   (b) Cluster
(c) Zone   (d) Sector

SECTION B (Long Answer Type)

Q.2. (a) [Theory/Diagram] Explain the basic **Cellular Mobile System** components (PSTN, MTSO/MSC, Base Station, Mobile Unit) with a general block diagram. **[7]**

> *[Important: Draw the General Block Diagram of Cellular System. Refer to Book/Google.]*

Q.2. (b) [Theory] Explain the concept of **Trunking** and **Grade of Service (GoS)**. What is a "blocked call"? **[7]**

Q.3. (a) [Theory/Derivation] Discuss the **Interference** in cellular systems. Explain "Signal to Interference Ratio (S/I)" and how it relates to Cluster Size (N). **[7]**

Q.3. (b) [Theory/Diagram] Explain the techniques used to improve coverage and capacity:
1. **Cell Splitting**
2. **Sectoring** (120° and 60° sectoring). **[7]**

> *[Important: Draw diagrams showing a Cell splitting into microcells and a Cell divided into sectors. Refer to Google.]*

Q.4. (a) [Theory] What is **Modulation**? Differentiate between Analog Modulation (AM, FM) and Digital Modulation (ASK, FSK, PSK). Why is digital modulation preferred in mobile comm? **[7]**

Q.4. (b) [Theory/Diagram] Explain **GMSK (Gaussian Minimum Shift Keying)**. Why is it used in the GSM standard? **[7]**

> *[Important: Draw the GMSK Waveform or Block Diagram. Refer to Google.]*

Q.5. (a) [Theory] Explain the **Power Control** mechanism in CDMA. Why is it necessary to solve the Near-Far problem? **[7]**

Q.5. (b) [Theory] Describe the **Mobile Station (MS) Authentication** process in GSM. What is the role of the SIM card and AUC (Authentication Center)? **[7]**

Q.6. [Detailed Long Answer] **[14]**

Explain Spread Spectrum Modulation Techniques in detail.

Your answer must cover:

- Definition and advantages of Spread Spectrum (Privacy, Anti-jamming).
- **DSSS (Direct Sequence Spread Spectrum):** Working principle, PN Sequence generator.
- **FHSS (Frequency Hopping Spread Spectrum):** Fast Hopping vs Slow Hopping.
- Comparison between DSSS and FHSS.

Q.7. Write Short Notes on (Any FOUR):   [3.5 × 4 = 14]

a. Cordless Telephone System

b. Erlang B vs Erlang C formula

c. Differences between GSM and CDMA

d. Wireless Local Loop (WLL)

e. Ad-hoc Networks

Diploma Wallah: Solution Key

MCQ: (i) c, (ii) c, (iii) b, (iv) a, (v) c, (vi) b, (vii) a.

Q2(b) Note: Grade of Service (GoS) is the probability of a call being blocked or delayed.

Q6 Hint: DSSS uses a high-speed pseudo-noise code to spread the signal over a wide band. FHSS changes the carrier frequency rapidly.

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