**18ECC301T –WIRELESS COMMUNICATION**

| Name | DR.SANDEEP KUMAR/  S.DIANA EMERALD AASHA | Unit No. | 1 |
| --- | --- | --- | --- |
| Designation / Department | ASSISTANT PROFESSOR/ECE | Unit Title | INTRODUCTION TO WIRELESS COMMUNICATION SYSTEM |

**Notations**

M - Marks

CO - Course Learning Outcome

BL - Bloom’s Level (1. Remembering | 2. Understanding | 3. Applying | 4. Analysing | 5. Evaluating

| 6. Creating)

PI - Performance Indicator Code

**Note**

1. Refer appendix / attachment for Bloom’s Taxonomy action verbs
2. Refer appendix / attachment for a model Performance Indicator
3. For each unit / CO, write 20 MCQs (10 questions in Level 1 & 2; 6 or 7 questions in Level 3; 3 or 4 questions in Level 4)
4. Both higher order cognitive skills ‘Evaluate’ and ‘Create’ are difficult to assess in time-limited examinations, and hence no questions may not be set up in Levels 5 & 6.
5. Fill up the table of CO / Bloom’s Level distribution given at the end of this document.

| **Q. No.** | **MCQ** | | **M** | **CO** | **BL** | **PI** |
| --- | --- | --- | --- | --- | --- | --- |
| 1. | During the handoff process in the cellular system, the margin (Threshold) is given by | |  | 1 | 1 |  |
|  | A. | ∆ = Pr(HANDOFF) - Pr (MAX. USABLE) |  |  |  |  |
|  | B. | ∆ = Pr(HANDOFF) - Pr (MIN. USABLE) |  |  |  |  |
|  | C. | ∆ = Pr(SAR OF THE MOBILE) - Pr (MIN. USABLE) |  |  |  |  |
|  | D. | ∆ = Pr(CELL) - Pr (BASE STATION) |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 2. | For a best cellular communication system, Handoff must be performed | |  | 1 | 1 |  |
|  | A. | successfully & as infrequently as possible |  |  |  |  |
|  | B. | successfully & as frequently as possible |  |  |  |  |
|  | C. | With more power emission |  |  |  |  |
|  | D. | With the same frequencies of mobile and base station |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 3. | Smallest of the handover type | |  | 1 | 1 |  |
|  | A. | Intra-cell-Intra BSC Handover |  |  |  |  |
|  | B. | Inter-cell-Intra BSC Handover |  |  |  |  |
|  | C. | Inter-cell-Inter BSC Handover |  |  |  |  |
|  | D. | Inter MSC Handover |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 4. | From the users point of view, the most preferred handoff classification is | |  | 1 | 1 |  |
|  | A. | Soft Handoff |  |  |  |  |
|  | B. | Hard Handoff |  |  |  |  |
|  | C. | Intra-cell-Intra BSC Handover |  |  |  |  |
|  | D. | Inter-cell-Intra BSC Handover |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 5. | While locating a co-channel cell, a RF site engineer will do the following mapping after moving ‘i’ cells along any particular direction | |  | 1 | 1 |  |
|  | A. | Turn 90 deg counter clockwise & move j cells |  |  |  |  |
|  | B. | Turn 60 deg clockwise & move j cells |  |  |  |  |
|  | C. | Turn 60 deg counter clockwise & Move j cells |  |  |  |  |
|  | D. | Move j cells and Turn 60 deg counter clockwise |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 6. | Erlang C system’s Probability depends upon the | |  | 1 | 1 |  |
|  | A. | Blocked Calls |  |  |  |  |
|  | B. | Blocked calls and delay |  |  |  |  |
|  | C. | Only the delay calls |  |  |  |  |
|  | D. | Erlang B |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 7. | In a trunked radio system (TRS) each user is allocated a channel on a | |  | 1 | 1 |  |
|  | A. | per frequency basis |  |  |  |  |
|  | B. | per channel basis |  |  |  |  |
|  | C. | per base station basis |  |  |  |  |
|  | D. | per call basis |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 8. | With respect to Erlangs, Maximum Load represents | |  | 1 | 1 |  |
|  | A. | Unity |  |  |  |  |
|  | B. | Infinity |  |  |  |  |
|  | C. | Zero |  |  |  |  |
|  | D. | Negative |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 9. | Resultant of imperfect receiver filters | |  | 1 | 1 |  |
|  | A. | Adjacent channel interference |  |  |  |  |
|  | B. | Co channel interference |  |  |  |  |
|  | C. | Network interference |  |  |  |  |
|  | D. | Stop band interference |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 10. | Co-channel interference relation depends on | |  | 1 | 1 |  |
|  | A. | Radius of cell |  |  |  |  |
|  | B. | Transmitted power |  |  |  |  |
|  | C. | Received power |  |  |  |  |
|  | D. | Frequency of mobile user |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 11. | The width of the Guard band is addressed by | |  | 1 | 1 |  |
|  | A. | how sharp the transceiver filter roll off factor is |  |  |  |  |
|  | B. | how sharp the transmitter filter roll off factor is |  |  |  |  |
|  | C. | how sharp the receiver filter roll off factor is |  |  |  |  |
|  | D. | how sharp the mobile station roll off factor is |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 12. | Antenna are not placed near to each other, otherwise \_\_\_\_\_\_\_\_\_\_ interference get increased. | |  | 1 | 1 |  |
|  | A. | adjacent channel |  |  |  |  |
|  | B. | co-channel |  |  |  |  |
|  | C. | constructive |  |  |  |  |
|  | D. | destructive |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 13. | Cell splitting\_\_\_\_\_\_\_\_ the transmitted power. | |  | 1 | 1 |  |
|  | A. | reduces |  |  |  |  |
|  | B. | increases |  |  |  |  |
|  | C. | enlarge |  |  |  |  |
|  | D. | put up |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 14. | Identify the channel to be used for a transmission of device power level from mobile station to base station | |  | 1 | 1 |  |
|  | A. | Forward Control Channel |  |  |  |  |
|  | B. | Reverse Control Channel |  |  |  |  |
|  | C. | Forward Voice Channel |  |  |  |  |
|  | D. | Reverse Voice Channel |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 15. | The data rate in 3G standard is | |  | 1 | 1 |  |
|  | A. | 144bps – 2Kbps |  |  |  |  |
|  | B. | 144Kbps – 2Gbps |  |  |  |  |
|  | C. | 144Kbps – 2Mbps |  |  |  |  |
|  | D. | 144Mbps – 2Gbps |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 16. | In the case of Handoff scenario, If the Threshold power is high then | |  | 1 | 1 |  |
|  | A. | Unnecessary Handovers will be present |  |  |  |  |
|  | B. | Unnecessary Handovers will be present without burdening Mobile switching Centre |  |  |  |  |
|  | C. | Unnecessary Handovers will be present with a load of burden on Mobile switching Centre |  |  |  |  |
|  | D. | Unnecessary Handovers will not be present |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 17. | In the Case of Cell Splitting with a Radius of R/4, the Transmitted Power is reduced by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dB with newer cell. Assume ‘n’ is the path loss exponent | |  | 1 | 1 |  |
|  | A. | 3n |  |  |  |  |
|  | B. | 6n |  |  |  |  |
|  | C. | 4n |  |  |  |  |
|  | D. | 2n |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 18. | In Borrowing Strategy,\_\_\_\_\_\_\_\_\_\_\_\_ supervises the borrowing of channel from neighbouring cells. | |  | 1 | 1 |  |
|  | A. | Mobile Switching Centre |  |  |  |  |
|  | B. | Base Station |  |  |  |  |
|  | C. | Mobile Station |  |  |  |  |
|  | D. | Cell |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 19. | Cell dragging is a practical handoff problem which arises due to the \_\_\_\_\_\_\_\_\_\_\_ | |  | 1 | 1 |  |
|  | A. | High speed mobile systems |  |  |  |  |
|  | B. | Pedestrian users |  |  |  |  |
|  | C. | Stationary users |  |  |  |  |
|  | D. | Base stations having same frequency |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 20. | Adjacent channel interference can be minimized through \_\_\_\_\_\_\_ | |  | 1 | 1 |  |
|  | A. | Changing frequency of base stations |  |  |  |  |
|  | B. | Careful filtering and channel assignments |  |  |  |  |
|  | C. | Increasing number of base stations |  |  |  |  |
|  | D. | Increasing number of control channels |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 21. | Which of the following priority handoff method decrease the probability of forced termination of a call due to lack of available channels? | |  | 1 | 4 |  |
|  | A. | Queuing |  |  |  |  |
|  | B. | Guard channel |  |  |  |  |
|  | C. | Cell dragging |  |  |  |  |
|  | D. | Near far effect |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 22. | Soft handoff is also known as \_\_\_\_\_\_\_\_\_ | |  | 1 | 1 |  |
|  | A. | MAHO |  |  |  |  |
|  | B. | Hand over |  |  |  |  |
|  | C. | Break before make |  |  |  |  |
|  | D. | Make before break |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 23. | If the handoff threshold is too large, apart from unnecessary handoffs | |  | 1 | 2 |  |
|  | A. | Mobile switching centre gets less load |  |  |  |  |
|  | B. | Mobile switching centre gets over loaded |  |  |  |  |
|  | C. | Mobile switching centre channels gets exhausted |  |  |  |  |
|  | D. | Base station gets optimally loaded |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 24. | Increase in capacity, without degradation in \_\_\_\_\_\_\_\_ efficiency is caused by sectoring. | |  | 1 | 2 |  |
|  | A. | erlang |  |  |  |  |
|  | B. | GOS |  |  |  |  |
|  | C. | trunking |  |  |  |  |
|  | D. | meandering |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 25. | In hexagonal shaped type of cell with 6 vertices ,how many antennas are needed for edge excitation | |  | 1 | 2 |  |
|  | A. | 1 |  |  |  |  |
|  | B. | 6 |  |  |  |  |
|  | C. | 3 |  |  |  |  |
|  | D. | 2 |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 26. | What is the distance between two co channel base stations? | |  | 1 | 2 |  |
|  | A. | 3N |  |  |  |  |
|  | B. | R√3N |  |  |  |  |
|  | C. | 3RN |  |  |  |  |
|  | D. | 3√N |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 27. | What is the Co-Channel reuse value for a cluster size of 12? | |  | 1 | 2 |  |
|  | A. | 3 |  |  |  |  |
|  | B. | 4.58 |  |  |  |  |
|  | C. | 6 |  |  |  |  |
|  | D. | 6.24 |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 28. | What is the Co-Channel reuse value for a cluster size of 7? | |  | 1 | 2 |  |
|  | A. | 3 |  |  |  |  |
|  | B. | 4.58 |  |  |  |  |
|  | C. | 6 |  |  |  |  |
|  | D. | 6.24 |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 29. | If a group of 100 users made 30 calls in one hour, and each call had an average call duration(holding time) of 5 minutes, then the traffic intensity is | |  | 1 | 3 |  |
|  | A. | 2.5 Erlangs |  |  |  |  |
|  | B. | 3 Erlangs |  |  |  |  |
|  | C. | 5 Erlangs |  |  |  |  |
|  | D. | 7.5 Erlangs |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 30. | The channel allocations for the cell sites are designed so that 2 out of 100 calls will be blocked due to channel occupancy during the busiest hour. Then the Grade of Service of non blocking is | |  | 1 | 3 |  |
|  | A. | 98% |  |  |  |  |
|  | B. | 2% |  |  |  |  |
|  | C. | 200% |  |  |  |  |
|  | D. | 50% |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 31. | What is the Frequency Reuse Distance for a cluster size of 7 with a cell radius 2 Kms? | |  | 1 | 3 |  |
|  | A. | 9.16 Kms |  |  |  |  |
|  | B. | 4.52 Kms |  |  |  |  |
|  | C. | 3.52 Kms |  |  |  |  |
|  | D. | 11.09 Kms |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 32. | A spectrum of 25 MHz is allocated to a cellular system which uses two 25 KHz simplex channels to provide full duplex voice channels. What is the number of channels available per cell for 4 cell reuse factor? | |  | 1 | 3 |  |
|  | A. | 150 channels |  |  |  |  |
|  | B. | 125 channels |  |  |  |  |
|  | C. | 1000 channels |  |  |  |  |
|  | D. | 250 channels |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 33. | Assume each user of a single base station mobile radio system averages three calls per hour, each call lasting on average of 5 minutes. What will be the traffic intensity of each user? | |  | 1 | 3 |  |
|  | | A. | | --- | | 0.25 Erlang |  |  |  |  |
|  | B. | 0.15 Erlang |  |  |  |  |
|  | C. | 0.6 Erlang |  |  |  |  |
|  | D. | 1 Erlang |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 34. | What is the cluster Size for i=4 and j=3 ? | |  | 1 | 3 |  |
|  | A. | 37 |  |  |  |  |
|  | B. | 19 |  |  |  |  |
|  | C. | 49 |  |  |  |  |
|  | D. | 7 |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 35. | How many users can be supported for 0.5% blocking probability for 5 number of trunked channels in a BCC system? If that each user generates 0.1 Erlangs of traffic. | |  | 1 | 3 |  |
|  | A. | 11 |  |  |  |  |
|  | B. | 12 |  |  |  |  |
|  | C. | 10 |  |  |  |  |
|  | D. | 9 |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 36. | A 30MHz bandwidth is allocated to a particular FDD cellular telephone system which uses two 30KHz simplex channels to provide full duplex voice and control channels .So what will be the total available channels in the system? | |  | 1 | 3 |  |
|  | A. | 500 Channels |  |  |  |  |
|  | B. | 1000 Channels |  |  |  |  |
|  | C. | 660 Channels |  |  |  |  |
|  | D. | 1320 Channels |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 37. | A Signal to Interference ratio of 18.66dB with 6 co channels in the first tier of the system and with a path exponent value of 4.What will be the co -Channel reuse ratio ? | |  | 1 | 3 |  |
|  | A. | 3 |  |  |  |  |
|  | B. | 4.58 |  |  |  |  |
|  | C. | 6 |  |  |  |  |
|  | D. | 6.24 |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 38. | What will be the total no of users if each user generates is 0.1E and the total offered traffic is 3.96? | |  | 1 | 3 |  |
|  | A. | 39 |  |  |  |  |
|  | B. | 4 |  |  |  |  |
|  | C. | 40 |  |  |  |  |
|  | D. | 11 |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 39. | The worst-case signal to interference ratio for a cluster size of 7 and path loss exponent of 4 is | |  | 1 | 4 |  |
|  | A. | Less than 18 dB and more than 7 dB |  |  |  |  |
|  | B. | More than 18 dB |  |  |  |  |
|  | C. | Less than 7 dB |  |  |  |  |
|  | D. | More than 28 dB |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 40. | I am a cellular coverage technique and I use different antenna heights and Tx power levels to provide large and small cell coverage. Identify me. | |  | 1 | 4 |  |
|  | A. | Umbrella Cells |  |  |  |  |
|  | B. | Cell Splitting |  |  |  |  |
|  | C. | Sectoring |  |  |  |  |
|  | D. | Microcell Zone Concept |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**Course Outcome and Bloom’s Level Distribution to the questions**

| Question No. | Course Outcome Distribution | | | | | | BL Distribution | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CLO-1** | **CLO-2** | **CLO-3** | **CLO-4** | **CLO-5** | **CLO-6** | **L1** | **L2** | **L3** | **L4** | **L5** | **L6** |
| 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 |  |  |  |  |  |  |  |  |  |  |  |  |
| 29 |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 |  |  |  |  |  |  |  |  |  |  |  |  |
| 36 |  |  |  |  |  |  |  |  |  |  |  |  |
| 37 |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 |  |  |  |  |  |  |  |  |  |  |  |  |
| 39 |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 |  |  |  |  |  |  |  |  |  |  |  |  |
| Total |  |  |  |  |  |  | **22** | **6** | **10** | **2** |  |  |
| % |  |  |  |  |  |  |  |  |  |  |  |  |