**618ECC301T –** **Wireless Communication**

| Name |  | Unit No. | 5 |
| --- | --- | --- | --- |
| Designation / Department |  | Unit Title | Wireless Systems and Standards |

**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. | The world first cellular system to represent digital modulation is \_\_\_\_\_\_\_\_\_\_. | | 1 | 5 | 1 |  |
|  | A. | ISDN |  |  |  |  |
|  | B. | GSM |  |  |  |  |
|  | C. | AMPS |  |  |  |  |
|  | D. | OFDM |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 2. | GSM stands for \_\_\_\_\_. | | 1 | 5 | 1 |  |
|  | A. | Global System for Mobile Communication |  |  |  |  |
|  | B. | Global Specific for Mobile Communication |  |  |  |  |
|  | C. | Global System for Multiple Communication |  |  |  |  |
|  | D. | Global Special for Mobile Communication |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 3. | \_\_\_\_\_ manages the switching function in GSM | | 1 | 5 | 1 |  |
|  | A. | ESS |  |  |  |  |
|  | B. | OSS |  |  |  |  |
|  | C. | MSC |  |  |  |  |
|  | D. | NSS |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 4. | OSS support the operation and maintenance of \_\_\_\_\_\_. | | 1 | 5 | 1 |  |
|  | A. | GSM |  |  |  |  |
|  | B. | APMS |  |  |  |  |
|  | C. | GPRS |  |  |  |  |
|  | D. | LTE |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 5. | GSM committee specified a common mobile communication system in \_\_\_\_\_\_\_\_band | | 1 | 5 | 1 |  |
|  | A. | 900MHz |  |  |  |  |
|  | B. | 900KHz |  |  |  |  |
|  | C. | 100KHz |  |  |  |  |
|  | D. | 900Hz |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 6. | GSM support services including \_\_\_\_\_\_ switched protocols. | | 1 | 5 | 1 |  |
|  | A. | circuit |  |  |  |  |
|  | B. | message |  |  |  |  |
|  | C. | packet |  |  |  |  |
|  | D. | AMPS |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 7. | GSM consists of \_\_\_\_\_ major interconnected subsystems that interact between themselves | | 1 | 5 | 1 |  |
|  | A. | four |  |  |  |  |
|  | B. | three |  |  |  |  |
|  | C. | two |  |  |  |  |
|  | D. | one |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 8. | \_\_\_\_\_ takes care of handoff. | | 1 | 5 | 1 |  |
|  | A. | BSC |  |  |  |  |
|  | B. | mobile |  |  |  |  |
|  | C. | BS |  |  |  |  |
|  | D. | BTS |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 9. | HLR Contains subscriber information and location information for each user who resides in the \_\_\_\_\_\_\_\_ city. | | 1 | 5 | 1 |  |
|  | A. | Different |  |  |  |  |
|  | B. | same |  |  |  |  |
|  | C. | opposite |  |  |  |  |
|  | D. | similar |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 10. | \_\_\_\_\_\_ temporarily stores the IMSI and customer information for each roaming subscriber. | | 1 |  | 1 |  |
|  | A. | HLR |  |  |  |  |
|  | B. | VLR |  |  |  |  |
|  | C. | HSR |  |  |  |  |
|  | D. | VSR |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 11. | \_\_\_\_ sends the necessary information to the visiting subscriber's HLR. | | 1 | 5 | 1 |  |
|  | A. | AMPS |  |  |  |  |
|  | B. | MSC |  |  |  |  |
|  | C. | BSC |  |  |  |  |
|  | D. | BTS |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 12. | In GSM superframe how many multiframe are available? | | 2 | 5 | 1 |  |
|  | A. | 51 |  |  |  |  |
|  | B. | 50 |  |  |  |  |
|  | C. | 49 |  |  |  |  |
|  | D. | 48 |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 13. | In GSM multiframe how many frame are available? | | 1 | 5 | 1 |  |
|  | A. | 29 |  |  |  |  |
|  | B. | 28 |  |  |  |  |
|  | C. | 27 |  |  |  |  |
|  | D. | 26 |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 14. | In GSM frame format how many time slots are available? | | 1 | 5 | 1 |  |
|  | A. | 2 |  |  |  |  |
|  | B. | 4 |  |  |  |  |
|  | C. | 6 |  |  |  |  |
|  | D. | 8 |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 15. | In spread spectrum several users can independently use the same \_\_\_\_\_ bandwidth with less interference. | | 1 | 5 | 1 |  |
|  | A. | Higher |  |  |  |  |
|  | B. | lower |  |  |  |  |
|  | C. | medium |  |  |  |  |
|  | D. | moderate |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 16. | In DSSS, the digital information stream with the spreading code bit stream using an \_\_\_\_\_\_operation. | | 1 | 5 | 1 |  |
|  | A. | ExOR |  |  |  |  |
|  | B. | NOT |  |  |  |  |
|  | C. | AND |  |  |  |  |
|  | D. | NAND |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 17. | In FHSS, \_\_\_\_\_\_\_\_ modulator is used. | | 1 | 5 | 1 |  |
|  | A. | BPSK |  |  |  |  |
|  | B. | ASK |  |  |  |  |
|  | C. | FSK |  |  |  |  |
|  | D. | MSK |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 18. | In DSSS, each bit in the original signal is represented by \_\_\_\_\_ bits in the transmitted signal. | | 1 | 5 | 1 |  |
|  | A. | Multiple |  |  |  |  |
|  | B. | Same |  |  |  |  |
|  | C. | One |  |  |  |  |
|  | D. | Equal |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 19. | In \_\_\_ Sequence Generation, transmitter and receiver need a copy of random bits. | | 1 | 5 | 1 |  |
|  | A. | PN |  |  |  |  |
|  | B. | SN |  |  |  |  |
|  | C. | FN |  |  |  |  |
|  | D. | AN |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 20. | DSSS system spreads the baseband signal by \_\_\_\_\_\_\_\_ the baseband pulses with a pseudo noise sequence. | | 1 | 5 | 1 |  |
|  | A. | Adding |  |  |  |  |
|  | B. | Subtracting |  |  |  |  |
|  | C. | Dividing |  |  |  |  |
|  | D. | Multiplying |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 21 | A digital cellular system based on \_\_\_\_\_\_ technology. | | 1 | 5 | 1 |  |
|  | A. | CDMA |  |  |  |  |
|  | B. | FDMA |  |  |  |  |
|  | C. | AMPS |  |  |  |  |
|  | D. | OFDMA |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 22 | IS-95 allows each user within a cell to use the same radio channel. | | 1 | 5 | 1 |  |
|  | A. | IS2000 |  |  |  |  |
|  | B. | IS 95 |  |  |  |  |
|  | C. | IS 91 |  |  |  |  |
|  | D. | IS 90 |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 23 | IS-95 channel occupies \_\_\_\_\_\_\_ of spectrum on each one-way link. | | 1 | 5 | 1 |  |
|  | A. | 2.5 KHz |  |  |  |  |
|  | B. | 1.25MHz |  |  |  |  |
|  | C. | 12.5 KHz |  |  |  |  |
|  | D. | 1.25 KHz |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 24 | In CDMA the forward and reverse channel pair is separate by \_\_\_\_\_. | | 1 | 5 | 1 |  |
|  | A. | 45 MHz |  |  |  |  |
|  | B. | 45 KHz |  |  |  |  |
|  | C. | 45 Hz |  |  |  |  |
|  | D. | 35 KHz |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 25. | In CDMA, the maximum user data rate is . | | 1 | 5 | 1 |  |
|  | A. | 9.6 kb/s |  |  |  |  |
|  | B. | 9.4 kb/s |  |  |  |  |
|  | C. | 9.2 kb/s |  |  |  |  |
|  | D. | 9 kb/s |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 26. | On the forward link, the user data stream is encoded using a rate \_\_\_\_\_\_\_\_convolutional code. | | 1 | 5 | 1 |  |
|  | A. | 1/4 |  |  |  |  |
|  | B. | 3/4 |  |  |  |  |
|  | C. | 1/2 |  |  |  |  |
|  | D. | 1/8 |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 27. | The reverse channel user data stream is first convolutionally encoded with a rate\_\_\_\_\_. | | 1 | 5 | 1 |  |
|  | A. | 1/4 |  |  |  |  |
|  | B. | 3/4 |  |  |  |  |
|  | C. | 1/3 |  |  |  |  |
|  | D. | 1/8 |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 28. | The \_\_\_\_\_\_ channel is used to send control information and paging messages from the base station to the mobiles. | | 1 | 5 | 1 |  |
|  | A. | Paging |  |  |  |  |
|  | B. | Reverse |  |  |  |  |
|  | C. | Forward |  |  |  |  |
|  | D. | Pilot |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 29. | \_\_\_\_\_\_\_\_ Channel is used for broadcasts synchronization messages to the mobile stations. | | 1 | 5 | 2 |  |
|  | A. | Synchronization |  |  |  |  |
|  | B. | Reverse |  |  |  |  |
|  | C. | Forward |  |  |  |  |
|  | D. | Pilot |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 30. | How many types of masks are used in the long code generator? | | 1 | 5 | 2 |  |
|  | A. | Four |  |  |  |  |
|  | B. | three |  |  |  |  |
|  | C. | two |  |  |  |  |
|  | D. | one |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 31. | All CDMA calls are initiated using the \_\_\_\_\_\_ mask. | | 1 | 5 | 2 |  |
|  | A. | Synchronization |  |  |  |  |
|  | B. | Reverse |  |  |  |  |
|  | C. | Forward |  |  |  |  |
|  | D. | Pilot |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 32. | In CDMA forward channel, the speech data rate applied to the transmitter is variable over the range of \_\_\_\_\_\_\_\_. | | 1 | 5 | 2 |  |
|  | A. | 1200 bps to 9600 bps |  |  |  |  |
|  | B. | 200 bps to 600 bps |  |  |  |  |
|  | C. | 800 bps to 1000 bps |  |  |  |  |
|  | D. | 1000 bps to 2000 bps |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 33. | In CDMA, the data on the forward traffic channel is grouped into \_\_\_\_ frames. | | 1 | 5 | 2 |  |
|  | A. | 20 ms |  |  |  |  |
|  | B. | 20 s |  |  |  |  |
|  | C. | 2 ms |  |  |  |  |
|  | D. | 100 ms |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 34. | A 64-ary orthogonal modulation is used for the reverse \_\_\_\_\_ channel. | | 1 |  | 2 |  |
|  | A. | FDMA |  |  |  |  |
|  | B. | CDMA |  |  |  |  |
|  | C. | AMPS |  |  |  |  |
|  | D. | OFDM |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 35. | In Quadrature Modulation how many channel are used for transmission. | | 1 | 5 | 2 |  |
|  | A. | 2 |  |  |  |  |
|  | B. | 4 |  |  |  |  |
|  | C. | 6 |  |  |  |  |
|  | D. | 8 |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 36. | \_\_\_\_\_\_\_ converts a frequency selective fading into flat fading channel. | | 1 | 5 | 2 |  |
|  | A. | MCM |  |  |  |  |
|  | B. | PCM |  |  |  |  |
|  | C. | DPCM |  |  |  |  |
|  | D. | AM |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 37. | \_\_\_\_\_\_\_\_\_\_ type of fading is used to detect signal easier. | | 1 | 5 | 2 |  |
|  | A. | Flat |  |  |  |  |
|  | B. | DSSS |  |  |  |  |
|  | C. | ICI |  |  |  |  |
|  | D. | ISI |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 38. | \_\_\_\_\_\_ Modulation is used in the operation of MCM. | | 1 | 5 | 2 |  |
|  | A. | QAM |  |  |  |  |
|  | B. | FM |  |  |  |  |
|  | C. | AM |  |  |  |  |
|  | D. | TM |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 39. | In cyclic prefix, Guard time between adjacent symbols is inserted to eliminate \_\_\_\_. | | 1 | 5 | 2 |  |
|  | A. | ISI |  |  |  |  |
|  | B. | MCM |  |  |  |  |
|  | C. | OFDM |  |  |  |  |
|  | D. | AMPS |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 40. | CP is \_\_\_\_\_\_ in order to preserve orthogonality | | 1 | 5 | 2 |  |
|  | A. | Inserted |  |  |  |  |
|  | B. | Removed |  |  |  |  |
|  | C. | Adjusted |  |  |  |  |
|  | D. | Splitted |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 41. | \_\_\_\_\_\_ increases required transmission bandwidth in the operation of OFDM | | 1 | 5 | 2 |  |
|  | A. | Cyclic Prefix |  |  |  |  |
|  | B. | QAM |  |  |  |  |
|  | C. | ISI |  |  |  |  |
|  | D. | CDMA |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 42. | A number of independently modulated sub-carriers result in \_\_\_\_\_\_. | | 1 | 5 | 2 |  |
|  | A. | Low PAPR |  |  |  |  |
|  | B. | high PAPR |  |  |  |  |
|  | C. | Very Low PAPR |  |  |  |  |
|  | D. | Equal PAPR |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |
| 43. | When PAPR is high then complexity of ADC and DAC will be \_\_\_\_\_\_\_. | | 1 | 5 | 3 |  |
|  | A. | Increases |  |  |  |  |
|  | B. | Decreases |  |  |  |  |
|  | C. | low |  |  |  |  |
|  | D. | Very low |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 44. | \_\_\_\_\_\_ demands strict synchronization in frequency & time to preserve orthogonality. | | 1 | 5 | 3 |  |
|  | A. | OFDM |  |  |  |  |
|  | B. | FDMA |  |  |  |  |
|  | C. | TDMA |  |  |  |  |
|  | D. | SDMA |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 45. | ISI occur only when \_\_\_\_ offset differs from CP duration. | | 1 | 5 | 3 |  |
|  | A. | Time |  |  |  |  |
|  | B. | Space |  |  |  |  |
|  | C. | MAM |  |  |  |  |
|  | D. | null |  |  |  |  |
|  | Ans. | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 46. | The basic unit of networking in \_\_\_\_\_\_ is a piconet. | | 1 | 5 | 3 |  |
|  | A. | Wifi |  |  |  |  |
|  | B. | MAN |  |  |  |  |
|  | C. | LAN |  |  |  |  |
|  | D. | Bluetooth |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 47. | Each master can connect to \_\_\_ slaves per piconet. | | 1 | 5 | 3 |  |
|  | A. | 5 |  |  |  |  |
|  | B. | 6 |  |  |  |  |
|  | C. | 7 |  |  |  |  |
|  | D. | 8 |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 48. | In Bluetooth Architecture \_\_\_\_ unit will act as a master and the others as slaves. | | 1 | 5 | 3 |  |
|  | A. | four |  |  |  |  |
|  | B. | three |  |  |  |  |
|  | C. | two |  |  |  |  |
|  | D. | one |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 49. | Each \_\_\_\_\_\_ has a unique hopping ID. | | 1 | 5 | 3 |  |
|  | A. | Master |  |  |  |  |
|  | B. | Slave |  |  |  |  |
|  | C. | Piconet |  |  |  |  |
|  | D. | LAN |  |  |  |  |
|  | Ans. | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 50. | A \_\_\_\_\_\_ is collection of the piconets connected in an Ad Hoc fashion. | | 1 | 5 | 3 |  |
|  | A. | Unit |  |  |  |  |
|  | B. | Device |  |  |  |  |
|  | C. | Master |  |  |  |  |
|  | D. | scatternet |  |  |  |  |
|  | Ans | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 51. | Frequency hopping occurs by \_\_\_\_\_\_ from one physical channel to another in a pseudorandom sequence.. | | 1 | 5 | 3 |  |
|  | A. | Adding |  |  |  |  |
|  | B. | Multiplying |  |  |  |  |
|  | C. | Jumping |  |  |  |  |
|  | D. | Removing |  |  |  |  |
|  | Ans | C |  |  |  |  |
|  |  |  |  |  |  |  |
| 52. | AMPS stand for \_\_\_\_\_\_\_\_\_\_. | | 1 | 5 | 3 |  |
|  | A. | Advanced Mobile Phone System |  |  |  |  |
|  | B. | Advanced Modulation Phone System |  |  |  |  |
|  | C. | Advanced Mobile Packet System |  |  |  |  |
|  | D. | Advanced Machine Packet System |  |  |  |  |
|  | Ans | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 53. | Bluetooth radios communicate using a \_\_\_\_ discipline. | | 1 | 5 | 3 |  |
|  | A. | TDD |  |  |  |  |
|  | B. | FDD |  |  |  |  |
|  | C. | CDD |  |  |  |  |
|  | D. | MDD |  |  |  |  |
|  | Ans | A |  |  |  |  |
|  |  |  |  |  |  |  |
| 54. | The first US cellular telephone system (AMPS) was developed by \_\_\_\_\_\_\_. | | 1 | 5 | 3 |  |
|  | A. | NOKIA |  |  |  |  |
|  | B. | SAMSUNG |  |  |  |  |
|  | C. | MOTOROLA |  |  |  |  |
|  | D. | AT & T BELL LAB |  |  |  |  |
|  | Ans. | D |  |  |  |  |
|  |  |  |  |  |  |  |
| 55. | AMPS is an analog cellular phone system using \_\_\_\_\_. | | 1 | 5 | 3 |  |
|  | A. | TDMA |  |  |  |  |
|  | B. | FDMA |  |  |  |  |
|  | C. | CDMA |  |  |  |  |
|  | D. | OFDM |  |  |  |  |
|  | Ans. | B |  |  |  |  |
|  |  |  |  |  |  |  |

**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 |  |  |  |  | ✔ |  |  | ✔ |  |  |  |  |
| 41 |  |  |  |  | ✔ |  |  | ✔ |  |  |  |  |
| 42 |  |  |  |  | ✔ |  |  | ✔ |  |  |  |  |
| 43 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 44 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 45 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 46 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 47 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 48 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 49 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 50 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 51 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 52 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 53 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 54 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
| 55 |  |  |  |  | ✔ |  |  |  | ✔ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |