

KATHMANDU UNIVERSITY  
End Semester Examination  
December, 2024

Marks Scored:

Level : B.E.

Year : IV

Exam Roll No. :

Time: 30 mins.

Course : ETEG 429

Semester : I

F. M. : 10

Registration No.:

Date : 31 Dec 2024

SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose the most appropriate answer and **encircle**.

1. Anxiety caused by being unable to access social media or mobile networks is called \_\_\_\_\_
  - a. Social media disconnection syndrome
  - b. No mobile phone phobia
  - c. Offline anxiety
  - d. Digital deprivation disorder
2. The name of the prototype mobile device used by Martin Cooper to make the first mobile phone call in 1973 was \_\_\_\_\_
  - a. Motorola MicroTAC
  - b. Motorola StarTAC
  - c. Motorola DynaTAC
  - d. Motorola V70
3. According to NTA, the minimum received signal power level for LTE technology (minimum RSRP) should not be less than \_\_\_\_\_
  - a. -82dBm
  - b. -87dBm
  - c. -95dBm
  - d. -100dBm
4. A technology in which voice and SMS services are delivered to LTE devices through the use of GSM circuit switched network is called \_\_\_\_\_
  - a. Circuit Switched FallBack
  - b. Circuit Switched CallBack
  - c. Circuit Switched BackWard
  - d. Circuit Switched Default
5. The main purpose of the Radio Access Network (RAN) is to \_\_\_\_\_
  - a. Manage billing and subscriber data
  - b. Handle user mobility and session management
  - c. Provide a connection between the user equipment and core network
  - d. Authenticate and encrypt user traffic
6. In 5G architecture, \_\_\_\_\_ is a responsible component for user authentication and connection management.
  - a. User Plane Function (UPF)
  - b. Access and Mobility Management Function (AMF)
  - c. Radio Network Controller (RNC)
  - d. Packet Data Network Gateway (P-GW)
7. The primary purpose of using cells in cellular mobile communication is to \_\_\_\_\_
  - a. Increase the power of the received signal
  - b. Improve the data transfer rate
  - c. Maximize the frequency reuse
  - d. Reduce the network cost
8. The most commonly suited environment for DAS (Distributed Antenna System) deployment is \_\_\_\_\_
  - a. Open rural areas
  - b. Dense urban environments and large indoor spaces
  - c. Indoor room
  - d. Mega cells

9. A type of handoff that occurs when the mobile device is communicating with multiple sectors of the same cell or base station is called \_\_\_\_\_.
  - a. Hard handoff
  - b. Soft handoff
  - c. Softer handoff
  - d. Vertical handoff
10. Near-Far problem in the cellular network can be mitigated with \_\_\_\_\_.
  - a. Proper frequency planning
  - b. Proper power control
  - c. Proper channel equalization
  - d. Beamforming
11. In cellular communication, key advantage of cell sectoring is \_\_\_\_\_.
  - a. Increased coverage area
  - b. Improved power efficiency
  - c. Reduced co-channel interference
  - d. Reduced network traffic
12. In a system with 30 user, if each user makes an average of 2 calls per hour in which each call in average lasts for 4 minutes, the calculated traffic intensity is \_\_\_\_\_.
  - a. 1 Erlangs
  - b. 2 Erlangs
  - c. 4 Erlangs
  - d. 8 Erlangs
13. Extended Erlang B formula is based on the assumption that \_\_\_\_\_.
  - a. All blocked calls are queued until they can be served
  - b. All blocked calls are lost and never retried
  - c. Blocked calls may be retried immediately or after a delay
  - d. No calls will be blocked in the system
14. GSM quad-band phones typically supports \_\_\_\_\_.
  - a. 850 MHz, 900 MHz, 1800 MHz, 1900 MHz
  - b. 800 MHz, 900 MHz, 1900 MHz, 2100 MHz
  - c. 800 MHz, 1200 MHz, 1600 MHz, 2000 MHz
  - d. 600 MHz, 900 MHz, 1800 MHz, 2100 MHz
15. Interface used for communication between the MSC and SMSC is called \_\_\_\_\_.
  - a. G interface
  - b. H interface
  - c. I interface
  - d. J interface
16. GSM network uses \_\_\_\_\_ to identify and locate the subscriber while roaming in a visited network.
  - a. IMSI
  - b. TMSI
  - c. MSISDN
  - d. MSRN
17. The monitoring of BCCH on the downlink when there is active connection is responsibility of \_\_\_\_\_ sublayer.
  - a. RR
  - b. CM
  - c. MM
  - d. CC
18. CDMA2000 standard was developed by \_\_\_\_\_.
  - a. 3GPP
  - b. 3GPP2
  - c. ITU
  - d. ETSI
19. In LTE networks, initial access information needed to synchronize and connect to the cell is provided by \_\_\_\_\_.
  - a. Paging Control Channel (PCCH)
  - b. Broadcast Control Channel (BCCH)
  - c. Physical Broadcast Control Channel (PBCH)
  - d. Multicast Control Channel (MCCH)
20. NTA has allocated \_\_\_\_\_ band to NTC for 5G trial in Nepal.
  - a. 2100 MHz
  - b. 2600 MHz
  - c. K-band (26 GHz)
  - d. Ka-band (28 GHz)

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SECTION "B"

[8 Q. × 5 = 40 marks]

*Attempt ALL questions. Each question carries 5 marks. Symbols have their usual meanings. Urgent appropriate assumptions are permissible. Marks are indicated inside brackets.*

1.
  - a. What is digital divide and what role could cellular mobile communication play to bring it down in developing countries like Nepal? [2]
  - b. What technological differences could we expect to see in 6G in comparison to previous generations? [3]
2.
  - a. What is primary difference between Stand Alone (SA) and Non-Stand Alone (NSA) 5G network? [2]
  - b. Sketch the network architecture block diagram of 4G network and write down at least one function of each of the components that you use. [3]
3.
  - a. List down the roles of MSC in cellular mobile communication network. [3]
  - b. List down the names of any four channel assignment strategies that we commonly use in cellular mobile communication network. [2]
4.
  - a. What is cell sectoring and what problems does it address in cellular mobile communication network? [3]
  - b. In what scenarios Erlang B and Extended Erlang B formulas most applicable in cellular mobile communication network? [2]
5.
  - a. What is the purpose of the Home Location Register (HLR) and Visitor Location Register (VLR) in GSM network? [3]
  - b. How does a cellular mobile communication network protect user identity during voice and data communication? [2]
6.
  - a. How does the Dedicated Control Channel (DCCH) differ from Common Control Channel (CCCH) in GSM network? [3]
  - b. Describe the functions of Layer 2 in GSM protocol suite. [2]

**P.T.O.**

7.

- a. Discuss the difference between SMS and other messaging service like Instant Messaging (IM). In what situation is SMS preferred over IM? [2]
- b. Why is WCDMA referred to as "Wideband CDMA," and how does it differ from narrowband CDMA? [3]

8.

- a. How does carrier aggregation improve the capacity and data rates of LTE-A networks in comparison to LTE only networks? [3]
- b. What is network slicing in 5G? [2]

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SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose the most appropriate answer and **encircle**.

1. Operations in the neural networks can perform
  - a. serial
  - b. parallel
  - c. serial or parallel
  - d. neither serial nor parallel
2. What is perceptron?
  - a. a single layer feed-forward neural network with pre-processing
  - b. an auto-associative neural network
  - c. a double layer auto-associative neural network
  - d. a neural network that contains feedback
3. An auto-associative network is:
  - a. a neural network that contains no loops
  - b. a neural network that contains feedback
  - c. a neural network that has only one loop
  - d. a single layer feed-forward neural network with pre-processing
4. What is gradient descent?
  - a. method to find the absolute minimum of a function
  - b. method to find the absolute maximum of a function
  - c. maximum or minimum, depends on the situation
  - d. method to find zero of a function
5. In perceptron learning, what happens when input vector is correctly classified?
  - a. small adjustments in weight is done
  - b. large adjustments in weight is done
  - c. no adjustments in weight is done
  - d. weight adjustments doesn't depend on classification of input vector
6. How can learning process be stopped in backpropagation rule?
  - a. there is convergence involved
  - b. no heuristic criteria exist
  - c. on basis of average gradient value
  - d. none of the mentioned

7. In unsupervised learning, the training dataset consists of
  - a. Input features only
  - b. Output labels only
  - c. Input features and output labels
  - d. neither input features nor labels
8. Classification is
  - a. Unsupervised learning
  - b. Supervised learning
  - c. Reinforcement learning
  - d. Both a) and c)
9. What is the primary goal of training an ANN?
  - a. To minimize the prediction error on the training data
  - b. To maximize the number of neurons in the hidden layers
  - c. To achieve 100% accuracy on the test data
  - d. To maximize the prediction error on the training data
10. What is the purpose of the loss function in a neural network?
  - a. It measures the accuracy of predictions
  - b. It measures the complexity of the model
  - c. It quantifies the difference between predicted and actual values
  - d. It controls the learning rate of the network
11. What is overfitting in neural networks?
  - a. A Model that performs well on training data but poorly on new data
  - b. A Model that works equally well on both training and testing data
  - c. A model with too few layers
  - d. A model that performs poorly on training data but well on new data
12. Which of the following is not a step in backpropagation algorithm?
  - a. Feed-forward computation
  - b. Backpropagation to the output layer
  - c. Backpropagation to the input layer
  - d. Backpropagation to the hidden layer
13. A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively. The output will be:
  - a. 76
  - b. 238
  - c. 128
  - d. 228
14. "Linguistic variables" in Fuzzy Logic are used to:
  - a. Encrypt natural language data
  - b. Represent variables that are not numbers but words or sentences
  - c. Optimize language processing in networks
  - d. Store language data efficiently
15. The truth values of fuzzy set is \_\_\_\_\_.
  - a. between 0 & 1
  - b. only 0
  - c. either 0 or 1
  - d. only 1

16. For the fuzzy set  $A = \{(X1, 0.3), (X2, 0.7), (X3, 0.4)\}$ , the complement of A would be represented as:
- $\{(X1, 0.4), (X2, 0.3), (X3, 0.1)\}$
  - $\{(X1, 0.21), (X2, 0.28), (X3, 0.22)\}$
  - $\{(X1, 0.3), (X2, 0.7), (X3, 0.4)\}$
  - $\{(X1, 0.7), (X2, 0.3), (X3, 0.6)\}$
17. Fuzzy Logic is primarily used in AI to deal with
- Data encryption
  - Precise and binary logic
  - Problems involving vague or ambiguous information
  - Network optimization
18. The principle of "fuzzy inference" in Fuzzy Logic involves
- Decrypting fuzzy data
  - Drawing conclusions from fuzzy rules and fuzzy inputs
  - Optimizing network inference
  - Compressing fuzzy data sets
19. The "centroid method" in Fuzzy Logic is a technique used for:
- Defining the center of a network
  - Defuzzification to find a crisp output
  - Encrypting the central values of a fuzzy set
  - Storing the central data of a fuzzy system
20. Which function is used to determine the degree of membership in a fuzzy set?
- Heaviside function
  - Sigmoid function
  - Membership function
  - Identity function

