JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/CSE/ES-CS701/2024-25

2024

SIGNAL AND SYSTEM

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions 5x2=10

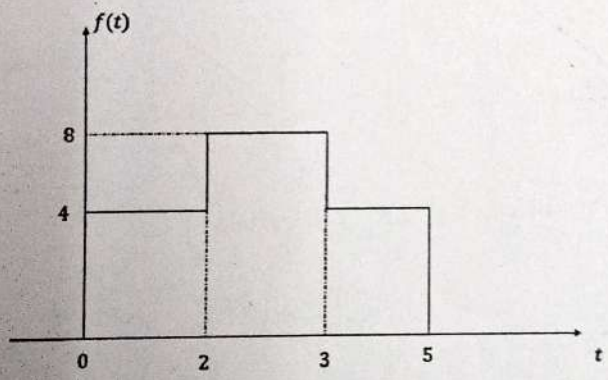
1. Find the odd and even components of the given signal. $x(n) = \{2,4,6,8,10\}$ 2
2. Define the Time Reversal operation of a signal with example. 2
3. Prove that $r(t-2) = (t-2).u(t-2)$ 2
4. Check whether the signal is energy or power→ $x(t) = Ae^{j\omega t}$. 2
5. Check whether the signal is periodic or not, if periodic, then find the Time period of the following signal.$x(t) = je^{j6t}$. 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions 15x4 =60

6. Find the Fourier Transform of the given signals. 3*5 = 15

i.



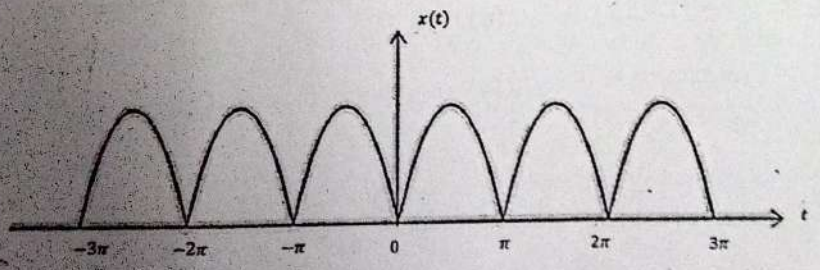
ii. $f(t) = e^{-at}u(t)$

iii. $f(t) = e^{at}u(-t) + e^{-at}u(t)$

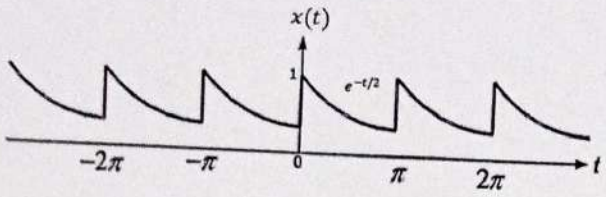
iv. $f(t) = u(t)$

v. $f(t) = A\,rect(t/\tau)$

7. a) Derive the Trigonometric Fourier Series Expansion and draw the corresponding line and phase spectrum of the following signal. 8+7 = 15

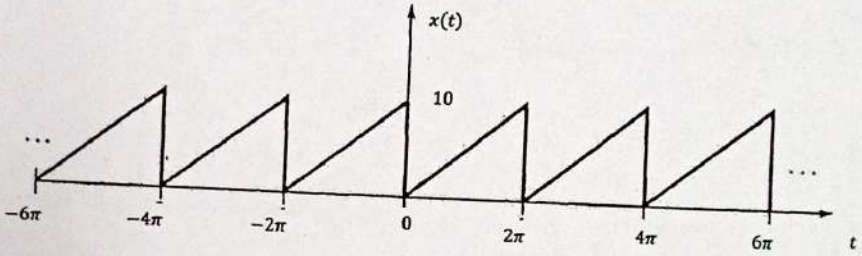


b) Find the Fourier series coefficients of the following signals using Trigonometric Fourier Series Expansion.

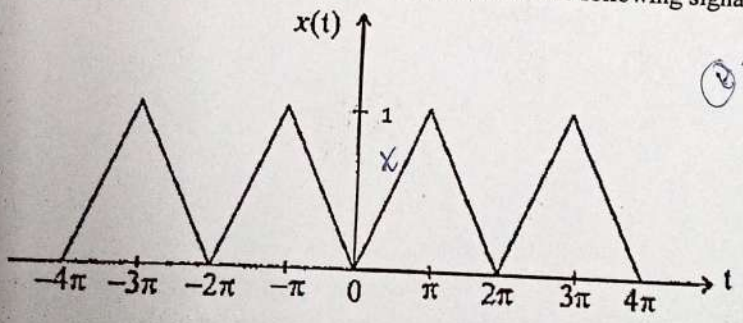


8. a) Discuss the Dirichlet Conditions with examples for Continuous Time Fourier series. 5+5+5 = 15
b) What is an energy and power signal? If x(t) =ASin (w0t+φ) , find its autocorrelation.
c) Draw and prove – i) $EVEN.EVEN = EVEN\ Signal$
ii) $ODD.ODD = EVEN\ Signal$

9. a) Discuss the frequency shifting property of continuous Time Fourier series and continuous Time Fourier Transform. 8+7 = 15
b) Find the Trigonometric Fourier Series coefficients for the following waveform with amplitude 10.



10. a) Find the Exponential Fourier Series coefficients for the following signal. 7+6+2 = 15



b) Find the circular convolution of the given data sequences using graphical or circular method only. $x1(n) = \{1,3,5,7\}\ and\ x2(n) = \{2,4,6\}$
c) What is zero padding?

11. a) Find the Linear Convolution of the data sequence by graphical method only. $x(n) = \{1,-2,3,-2\}; h(n) = \{2,-3,4\}$
↑ ↑ 7+4+4 = 15
b) (i) Define a time-invariant system and a linear system with examples.
(ii) Give definition of casual, Anti-casual and Non-casual signals with examples.

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JGEC/B.TECH/CSE/OEC-CS702C/2024-25
2024

Introduction to GIS and Remote Sensing

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. What is radar backscatter coefficient?
2. What are the advantages of microwave remote sensing compared to the optical remote sensing?
3. Explain the future trends of remote sensing.
4. What do you mean by spectral signature?
5. What is the basic difference between raster and vector data?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions 4x15 = 60

6. i) Define remote sensing. What are the components of remote sensing? 2+5
   ii) Define active and passive remote sensing. How the remote sensing can be applied in environmental monitoring? 2+3
   iii) What are the challenges in remote sensing? 3

7. i) Explain in detail the platforms of remote sensing. 5
   ii) Name different types of satellites and state the fundamental difference among them. 5
   iii) Compare and contrast between the Push-broom and Whisk-broom scanners. 5

8. i) What is the special feature of Geospatial data? 2
   ii) What is electromagnetic spectrum? Explain the properties of different types of spectrum/rays present in the electromagnetic spectrum. 3+5
   iii) Explain the applications of different types of spectrum present in the electromagnetic radiation. 5

9. i) Explain the different components of GIS? Explain the applications of active microwave remote sensing? 5+5
   ii) Explain the different types of microwave bands along with their corresponding frequencies and wavelengths used in microwave remote sensing? 5

10. i) What is aerial photography? Explain the characteristics of aerial photography. 2+6
    ii) What factors influence the aerial photography? 7

11. i) What is the difference between high oblique and low oblique photograph? 2
    ii) What do you understand by photogrammetry? Explain the photogrammetry process. 2+6
    iii) Write down the applications of photogrammetry. 5

12. Write short notes on (Any three): 5+5+5
    i) RADAR
    ii) Imaging vs. Non-Imaging sensor
    iii) Passive Microwave Remote Sensing
    iv) Remote Sensing Image Classification
    v) Spatial Operations of GIS

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JGEC/B.TECH/CSE/PEC-CS701E/2023-24
2023
MACHINE LEARNING

Full Marks: 70 Times: 3 Hours

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GROUP-A
[OBJECTIVE TYPE QUESTIONS]

5x2=10

Answer ***all*** questions

1. What is cross validation?
2. "Deep learning always gives better results than machine learning"- Justify your answer.
3. Why elbow method used in the K-Means algorithm?
4. What is the trade-off between bias and variance?
5. What is the significance of AUC curve?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

4x15 = 60

Answer any ***four*** questions

6. i) Why Support Vector Machine (SVM) is an example of a maximum margin classifier? What are Support Vectors in SVMs? Why kernel trick is used in SVM? 3+2+3
   ii) Explain the K-Means clustering algorithm with an example. 7

7. i) What is an Ensemble learning method? Compare the different types of ensemble learning methods? 2+3
   ii) What is a Random Forest? How does it work? 2+3
   iii) How will you know which Machine Learning algorithm to choose for your classification problem? 5

8. i) What are the assumptions of linear regression? Is linear regression suitable for time series data? How the logistic regression can be used in prediction purpose? 1+2+2
   ii) How Principal Component Analysis (PCA) is used for dimensionality reduction? How is the first principal component axis selected in *PCA* method? 5+5

9. i) Explain the K-NN algorithm with an example. 7
   ii) Explain the Naive Bayes classifier with an example. What are the different types of Naive Bayes classifiers? 6+2

10. i) What is underfitting? How it can be avoided? 2+3
    ii) Differentiate between Supervised, Unsupervised and Reinforcement Learning. 5
    iii) Discuss the disadvantages of decision trees. What is confusion matrix? 3+2

11. i) What are the three stages of building the hypotheses or model in machine learning? 5
    ii) What is Regularization? What kind of problems does regularization solve? 2+3
    iii) Compare and contrast between classification and regression. 3
    iv) How would you handle an imbalanced dataset? 2

12. Write short notes on (Any **three**): 5+5+5
    i) Statistical Learning Theory
    ii) Convolutional Neural Network (CNN)
    iii) Deep Learning
    iv) Gaussian mixture model
    v) Semi–supervised Learning

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2024
MACHINE LEARNING

Full Marks: 70 Times: 3 Hours

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GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. What is the relation among AI, Machine Learning and Deep Learning?
2. How the logistic regression can be used in prediction purpose?
3. Why elbow method is used in the K-Means algorithm?
4. What is the trade-off between bias and variance?
5. What is the significance of ROC curve?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions 4x15 = 60

6. i) Why Support Vector Machine (SVM) is an example of a maximum margin classifier? What are Support Vectors in SVMs? What are hard margin and soft margin SVMs? Why kernel trick is used in SVM? 3+2+2+3
   ii) Explain the K-Means clustering algorithm with an example. 5
7. i) What is an Ensemble learning method? Compare the different types of ensemble learning methods? 2+3
   ii) What is a Random Forest? How does it work? 2+3
   iii) How will you know which Machine Learning algorithm to choose for your classification problem? 5
8. i) What is the difference between correlation and regression? Explain the different types of regression mechanisms? 2+3
   ii) How Principal Component Analysis (PCA) is used for dimensionality reduction? How is the first principal component axis selected in *PCA* method? 5+5
9. i) Explain the K-NN algorithm with an example. 7
   ii) Explain the Naive Bayes classifier with an example. What are the different types of Naive Bayes classifiers? 6+2
10. i) What is overfitting and underfitting in machine learning? How it can be addressed? 3+2
    ii) Explain the different learning paradigms that exist in machine learning with example. 5
    iii) Compare the advantages and disadvantages of decision trees. What is confusion matrix? 3+2
11. i) Explain the different layers in CNN? Why do we use a Pooling Layer in a CNN? What are the different types of Pooling? Explain their characteristics. 5+2+3
    ii) Compare and contrast between classification and regression. 3
    iii) How would you handle an imbalanced dataset? 2
12. Write short notes on (Any **three**): 5+5+5
    i) Statistical Learning Theory
    ii) Deep Learning
    iii) Gaussian mixture model → (GMM)
    iv) Reinforcement Learning
    v) Artificial Neural Network

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JGEC/B.TECH/CSE/PEC-CS701C/2024-25

2024

NEURAL NETWORK AND DEEP LEARNING

Full Marks: 70 Times: 3 Hours

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GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. What is receptive field? Give one example.
2. What is optimization in a CNN model? Name two such optimization techniques.
3. What is the effect of 1 x 1 convolutions on a feature map?
4. Explain over-fitting in a CNN model?
5. Briefly describe sigmoid activation function.

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions 4x15=60

6. i) Explain binary cross entropy loss and multi class cross entropy loss with expressions and examples. 8
   ii) Suppose given a neural network for classification. The last layer is a dense layer with softmax activation. There are five different classes to classify. Suppose for a single training example, the true label is [1 0 0 0 0] while the predictions be [0.1 0.5 0.1 0.1 0.2]. How would I calculate the cross entropy loss for this example? 7

7. i) Explain convolution operation with suitable examples when applied on a 3d feature map. 5
   ii) Find dimensions of output feature map when 64 numbers of kernel (each kernel is of size 5x5) are applied on an input feature map of size 64x112x112 (CxHxW). Use padding=2 and stride=2. 5
   iii) Given an input feature map 32x128x128 (CxHxW). A convolution operation with a kernel size of KxK is applied on it. What should be the padding size and number of different kernels required if the desired output feature map size is 192x128x128(C x H x W) ? (Consider K is Even and stride is 1) 5

8. i) Explain sequence learning problem with examples. 3
   ii) Explain Recurrent Neural Network (RNN) with suitable diagram. Clearly mention dimensions of each parameter, state function and output function at a specific timestamp. 6
   iii) Draw the diagram of a typical Convolutional Neural Network (CNN) used in classification and explain each component and its purpose in the network. 6

9. i) Describe 'Softmax' function with a numerical example 3
   ii) What is Depth wise separable convolution and how does it reduce computing cost compared to general convolution. 6
   iii) Explain Batch Normalization and its objective with a numerical example. 6

10. i) What is the purpose of the learning rate during training and how does high learning rate affect the model training? 4
    ii) Form a Perceptron model and train it to realize the logical AND function. 5
    iii) Explain Gradient Descent Rule and associated parameter update equations. 6

11. i) Differentiate between crisp and fuzzy set. 5
ii) Explain in detail the architecture of McCulloch – Pitts neuron model and also realize AND, OR gate using the above neuron model. 10

12. i) Explain back propagation in neural network. 5
ii) Derive output equations and weight update equations for a multilayer feed forward neural network using back propagation algorithm. 10

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2024

HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR

Full Marks: 70 Time: 3 Hours

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GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions: 5x2=10

1. What is personality? 2
2. What is job satisfaction? 2
3. Define conflict. 2
4. What is motivation? 2
5. What is perception? 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions: 4x15 =60

6. What is stress? What stress management steps can organizations take to minimize stress among employees? Explain the factor theory of Herzberg. 3+6+6

7. What is organizational behaviour? Write its importance. Write determinants of personality. What are the types of personality? Write a note on personality, attitude and job satisfaction 2+3+3+3+4

8. Write a note on common errors we make while judging others. What are the various factors that affect perception, and decision-making? 5+10

9. Explain motive and motivation. Explain in detail the motivation theory of need hierarchy propagated by Maslow. 6+9

10. Define leadership. What are the various ingredients a leader should possess? Write about the trait theory of leadership. 3+6+6

leadership

11. Explain functional and dysfunctional conflict. Write a note on latent conflict, perceived conflict, felt conflict, manifest conflict, and behavioural conflict. 5+10
