

Total No. of Questions : 08

Pr. & Questions
Mtech CSE
Sem - I

Subject Code : MTCS-102-18

M.Code : 75154

Date of Examination: 16-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. (a) Define Dictionary and Dictionary with duplicates. List the operations performed on a dictionary.
(b) Use linear probing, a hash table with $b = 13$ buckets, and the hash function $f(k) = k \bmod b$. Start with an empty hash table and insert pairs whose keys in order are 7, 42, 25, 70, 14, 38, 8, 21, 34, 11. Draw the hash table following each insert.
2. (a) Explain Skip List. Why it is called as a Randomized Data structure.
(b) Explain the Operations Insertion, Deletion and Searching with a Skip List.
3. Suppose eight characters have a distribution A(1), B(1), C(1), D(2), E(3), F(5), G(5), H(10). Draw a Huffman tree and calculate average number of bits needed for each character.
4. Construct a binary search tree by inserting in the following sequence of integers: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60 and 24. Check whether the BST is balanced or not and if not balanced make it balanced.
5. What do you mean by range searching? Give appropriate examples of one dimensional range searching in order to explain the concept.
6. What is a Red black tree? What is the big-oh performance for find, insertion and remove for Red Black tree in best, worst and average cases.
7. What are quad trees? What are the steps in the construction of a quad tree? Explain search and insert functions in a quad tree.
8. What is computational geometry? What are the classical problems in the classical geometry? What are the computational geometry methods for problem solving? How various computational geometry methods can be used to efficiently solve new evolving problems?

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Roll No.

Total No. of Pages : 01

Total No. of Questions : 08

M.Tech. (CSE) (Sem.-1)

MACHINE LEARNING

Subject Code : MTCS-105-18

M.Code : 75155

Date of Examination : 07-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1.
 - a) How does the Nearest-Neighbors algorithm works?
 - b) How decision trees are used in Machine Learning?
2.
 - a) Discuss the main objective of Linear Regression.
 - b) What is the primary concept of a Support Vector Machine (SVM) in a classification?
3.
 - a) What is the primary goal of Statistical Learning Theory?
 - b) Discuss how RandomForests works?
4. What is PCA in machine learning? How does PCA achieve dimensionality reduction in a dataset?
5. Define following :
 - a) Bayesian Learning
 - b) Distributed learning
6. Discuss the main objective of deep learning and how does it help in improving model performance?
7. Provide an example of a task that can be effectively solved using reinforcement learning.
8. Discuss the latest advancements in machine learning techniques for enhancing IoT data analysis and decision making.

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Roll No.

Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(CSE/ECE/EE/Power System/VLSI Design) (Sem.-1)

RESEARCH METHODOLOGY AND IPR

Subject Code : MTRM-101-18

M.Code : 75161

Date of Examination :24-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. Write short note on the following:
 - a) Components of a research problem.
 - b) Characteristics of a good research problem.
2. Differentiate between primary and secondary data. Explain various methods of data collection.
3. What is the best way to prevent plagiarism and fraud in research? How can you avoid unintentional plagiarism when revising your draft?
4. Write a short note on the following:
 - a) What is a trademark? How it is different from brand?
 - b) What kind of products are covered under industrial design protection?
 - c) Enlist the types of works covered by copyright.
5.
 - a) Differentiate between industrial design, trademark, and patent.
 - b) Discuss the procedure for grant of a patent.

6. Elaborate in detail the significance of research reports and investigate the different steps involved in writing such a report.

7. Elaborate the following :

a) IPR of Biological Systems

b) New developments in IPR

8. A plant has installed two machines producing polythene bags. During the installation, the manufacturer of the machine has stated that the capacity of the machine is to produce 20 bags in a day. Owing to various factors such as different operators working on these machines, raw material, etc. There is a variation in the number of bags produced at the end of the day. The company researcher has taken a random sample of bags produced in 10 days for machine 1 and 13 days for machine 2, respectively. The following data gives the number of units of an item produced on a sampled day by the two machines:

Machine 1	18	19	19	18	17	19	18	19	18	19			
Machine 2	16	17	17	17	16	18	16	16	17	17	16	16	17

How can the researcher determine whether the variance is from the same population (population variances are equal) or it comes from different populations (population variances are not equal)? Take $\alpha = 0.05$ as the confidence level.

Total No. of Questions : 08

Total No. of Pages : 01

M.Tech. (Computer Science & Engineering) (Sem.-1)

DATA SCIENCE

Subject Code : MTCS-108-18

M.Code : 75158

Date of Examination : 15-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. Define Data Science. Explain the various components of Data Science in detail.
2. Differentiate between AI, BI, Machine Learning and Data Science.
3. What are the various sources of data collection? How the data is collected and stored?
4. Differentiate between Linear Regression and Polynomial Regression.
5. Explain Naive Bayes with the help of example.
6. How data is pre-processed using python?
7. Write a note on recent trends in data collection and analysis.
8. Explain binning method used in pre-processing of data.

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Total No. of Questions : 08

Total No. of Pages : 01

M.Tech. (CSE) (Sem.-1)
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code : MTCS-101-18

M.Code : 75153

Date of Examination : 16-01-2025

Max. Marks : 60

Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. Define variance and co-variance. How and where they are used?
2. Discuss the concept of probabilistic inequalities Markochains with example.
3. What is sampling? What are its types? Explain.
4. Write a note on methods of moments and maximum likelihood.
5. Define PCA. How and when it is used? Discuss with example.
6. Write a note on planar graphs, graph coloring and Euler cycles.
7. Differentiate between Operating Systems and Distributed Systems.
8. Explain recent trends of mathematical foundation in biometric and soft computing.

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Total No. of Pages : 01

HUMAN AND COMPUTER INTERACTION

Subject Code : MTCS/209/18

M.Code : 76060

Date of Examination : 22-05-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. What are mental models, and why are they important in interface design?
2. Explain the interaction design process in detail.
3. Explain the cognitive models in detail.
4. Differentiate between Face to face communication and Text based communication.
5. Explain all the components of mobile ecosystem.
6. **Write about :**
 - (a) Overlays.
 - (b) Inlays and
 - (c) Virtual pages.
7. Explain the process of speech recognition.
8. What is the importance of Ergonomics?

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Total No. of Questions : 08

Total No. of Pages : 01

M.Tech. (CSE) (Sem.-2)

COMPUTER VISION

Subject Code : MTCS/208/18

M.Code : 76059

Date of Examination : 18-05-2024

Time : 3 Hrs.

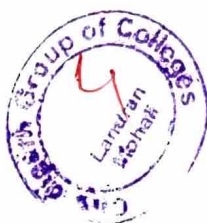
Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

- INSTRUCTIONS TO CANDIDATES :**
1. Attempt any FIVE questions out of EIGHT questions.
 2. Each question carries TWELVE marks.

1. Write a note on Bayes classification model.
2. Differentiate between edge and corner detection.
3. Write a note on Biometrics and Activity Recognition.
4. What is data pre-processing? What are its steps and how it is performed?
5. What is clustering? Explain with an example k-means algorithm.
6. What are various methods of dimension reduction? Explain.
7. Explain in detail computer imaging system. Also describe image formations.
8. How KNN and ANN classifier models work?

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Total No. of Pages : 01

Total No. of Questions : 08

M.Tech. (CSE) (Sem.-2)

SOFT COMPUTING

Subject Code : MTCS-202-18

M.Code : 76056

Date of Examination : 11-05-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.

2. Each question carries TWELVE marks.

1. a) Give the use of Artificial Neural Networks in Soft Computing.s
 b) Discuss the constituents of soft computing.
2. Explain with help of example fuzzy decision making.
3. Describe in detail the working of fuzzy sets, fuzzy relations and fuzzy rules.
4. Differentiate between supervised learning NN, Unsupervised learning NN and Reinforcement learning.
5. Write the Back Propagation Algorithms. Discuss the convergence issues in the back propagation algorithms.
6. Explain in detail Adaptive Resonance Architecture and its components.
7. a) Define the crossover and mutation operator in Genetic Algorithms.
 b) Explain the use of function and file for ANN and fuzzy logic in Python.
8. Write a note on recent trends in deep learning, neural networks and genetic algorithms.

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Total No. of Questions : 08

M.Tech. (CSE) (Sem.-2)

ADVANCE ALGORITHMS

Subject Code : MTCS-201-18

M.Code : 76055

Date of Examination : 08-05-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. What are the applications of Minimal Spanning tree? Explain any method to find Minimal spanning tree in detail with suitable examples. (12)
2. Discuss matching in a general graph using Edmond's Blossom algorithm. (12)
3. State and explain Strassen's Matrix Multiplication. Give time complexity and Recurrence Relation for Strassen's Matrix Multiplication. (12)
4. Explain any LUP algorithm in detail.
5. a) Explain the geometry of feasibility region. (6)
b) Explain the concepts of P, NP and NP completeness. (6)
6. Discuss the use of sorting algorithms in solving the latest problems. (12)
7. Explain Schonhage-Strassen Integer Multiplication algorithm. (12)
8. Differentiate the following techniques :
a) Maximum flows and minimum cuts in a graph (6)
b) Max flow and min cut. (6)

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Total No. of Pages : 01

Total No. of Questions : 10

M.Tech (ME) (Sem.-1)
FINITE ELEMENT ANALYSIS

Subject Code : MTME/102

M.Code : 74716

Date of Examination : 13-06-2024

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions in all out of EIGHT.
2. Each question carries TWENTY marks.
1. Discuss the general procedure for finite element analysis of physical problems. What are the various considerations to be taken in the discretization process for finite element analysis?
2. Develop finite element characteristics for fluid flow using stream function in two-dimensional flow.
3. Derive the expression of shape function for heat transfer in a 2-D element.
4. Derive shape functions in natural coordinates and obtain Jacobian matrix for four-noded isoparametric quadrilateral element.
5. Write short notes on :
 - a) Difference between boundary value and initial value problems.
 - b) Pre and Post processing in FEA.
 - c) Weighted residual's method.
 - d) Stream functions.
6. Derive finite element heat transfer model for a 2-node linear element considering both conduction and convection.
7.
 - a) What is a global stiffness matrix? How will you assemble a global stiffness matrix for a single truss element?
 - b) Differentiate between a truss element and a flexure element. Discuss the elementary beam theory used for developing flexure elements.
8. Analyze a simply supported beam subjected to a uniformly distributed load throughout using Rayleigh Ritz method. Adopt one-parameter trigonometric function. Evaluate the maximum deflection and bending moment and compare with the exact solution.

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Total No. 01

Total No. of Questions : 08

M.Tech. (ME) (Sem.-3)
AUTOMATION & ROBOTICS

Subject Code : MTME-206

M.Code : 74982

Date of Examination : 12-06-2024

Time : 3 Hrs.

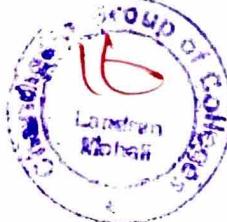
Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT question.
2. Each question carry TWENTY marks.

1. a) What do you mean by Automation in production system? (10)
b) Discuss basic elements of an automated system. (10)
2. Discuss the classification and types of automatic transfer machines used in manufacturing automation. (20)
3. Discuss the basic classification and application of industrial robot. (20)
4. Discuss the constructional details and applications of various transfer devices used for job orienting and picking operations. (20)
5. a) Give the differences between Mechanization and Automation. (10)
b) Discuss various types of Automations. (10)
6. Discuss Flexible Manufacturing Automation and explain significance of Automated Assembly System. (20)
7. a) Define degree of freedom in robot technology. (5)
b) Discuss various economical and social issues related to robot technology in manufacturing Industry. (15)
8. Discuss the features and requirements of having automated storage and retrieval system in manufacturing Industry. (20)

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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech (ME) (Sem.-2,3)

SUPPLY CHAIN MANAGEMENT

Subject Code : MTME/212

M.Code : 74988

Date of Examination : 14-06-2024

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

1.
 - a) Explain the types of obstacles occur in achieving the goals of SCM.
 - b) Explain the Push, Pull and Push-pull systems. What is the effect of moving push pull boundary earlier in the supply chain?
2. What do you mean by supply chain drivers? Explain framework for structuring these drivers with suitable examples.
3.
 - a) Explain the supply chain process cycles with examples.
 - b) ZF Steering Co. supply steering wheels to Mahindra & Mahindra for the existing products. Mahindra approaches ZF steering to develop and supply steering wheels for its new products- the Logan. It wants you to invest in the necessary tools required for the same and this will involve substantial investment. Analyse and recommend systematically; what Mahindra should do to reduce transaction costs in the arrangement and to ensure consistent quality of good quality steering wheels.
4.
 - a) What do you mean by 'supply chain and competitive performance'? Discuss.
 - b) Explain the routing and scheduling in supply chain.
5.
 - a) What do you mean by activity based costing? Explain cost drivers with examples.
 - b) Explain the design options for a transport network.
6.
 - a) Why is it for a firm to periodically review its logistic network design? How do firm requirements for its logistics network change over time?
 - b) How will you determine appropriate level of safety of inventory in supply chain? Discuss.



7. Write the short notes on the following :

- a) Bullwhip effect
- b) Customer profitability analysis in logistics
- c) Managerial levers to achieve coordination
- d) Mapping of supply chain processes.

8. a) Explain the logistics performance indicators of SCM

- b) How does lack of coordination in the supply chain impact the performance of the supply chain?

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Total No. of Questions : 08

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M.Tech. (ECE) (Sem.-2)

ADVANCED DIGITAL SIGNAL PROCESSING

Subject Code : MTEC/104/18

M.Code : 76260

Date of Examination : 11-05-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. a) Write a short note on design of IIR filter by the Bilinear Transformation Method.
b) Convert the analog filter with system function

$$H(s) = \frac{s+0.1}{(s+0.1)^2 + 9}$$

into a digital IIR filter by means of the impulse invariance technique.

2. Discuss the concept of decimation and interpolation with suitable example. Also, discuss QMF filters in detail.
3. a) What is Linear prediction? Explain in detail forward-backward linear prediction filters.
b) How FIR wiener filter can be used as noise cancellation?
4. a) Discuss in detail about adaptive filter applications.
b) Describe LMS adaptive algorithm with a neat diagram.
5. a) Explain the estimation of spectra from finite-duration observations of signals.
b) Compare Parametric and Non-Parametric methods of spectral estimation in detail.



6. a) Differentiate between FIR and IIR filters. Also, discuss the difference in their structures.
b) Discuss the application of multi-rate signal processing to sub-band coding.
7. a) Discuss Wiener filters for filtering and prediction.
b) Explain minimum mean square criterion for adaptive filters.
8. Discuss the applications of digital signal processing in radar and image processing.

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Total No. of Questions : 8

Total No. of Pages : 02

M.Tech. (ECE) (Sem.-2)

NANO ELECTRONICS

Subject Code : MTEC/PE4A/18

M.Code : 76265

Date of Examination : 25-05-2024

Max. Marks : 60

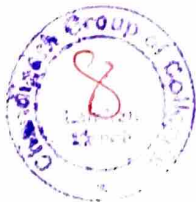
Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

INSTRUCTIONS TO CANDIDATES :
1. Attempt any FIVE questions out of EIGHT questions.

2. Each question carries TWELVE marks.

1. a. Draw Fermi levels related to semiconductors and conductors. 6
- b. Discuss optical, electrical, and mechanical properties of Nanomaterials. 6
2. a. Discuss the time scale and length scale developments in Nanotechnology. 6
- b. Give the advantages and disadvantages of CNT over conventional electrical material used in electronics industry. 6
3. a. Explain the structure of Single-walled Carbon Nano Tube (SWCNT) with neat diagram. Also mention the impedance parameters of SWCNT. 4+3
- b. Explain the method for generation of carbon nano tubes (CNT). 5
4. a. Discuss in detail the construction and working of double beam UV-Visible spectrophotometer. 6
- b. Explain construction and working of Arc discharge method for fabrication of Nanomaterials. 6
5. a. Explain the difference between Electron Microscopy Methods (SEM and TEM). 6
- b. Draw and explain the high electron mobility transistor. 6
6. a. Explain Photoemission Spectroscopy in detail with suitable diagrams. 6
- b. Define Bragg's law and explain working of X-RD spectroscopy. 6
7. a. Discuss the Quantum electron devices. 6
- b. What is DNA computing? Explain the structure of DNA. 6



SECTION-C

17. Case Study :

Adidas and Reebok are facing tough competition from their rival firm Nike. Nike had about 36 percent, Adidas 8.9 percent and Reebok 12.2 percent market share in the athletic footwear market in North America. In order to compete with Nike, which has very strong market share in North America and globally, Adidas announces the plan to acquire Reebok on 3rd August, 2005, and deal was finalized on 31st January, 2006.

Adidas wanted to compete with Nike in North American market. Nike leads the US market as well as global market by giving a tough competition to Adidas and Reebok, which were competing for the second and third positions. Nike was the first choice of billions of people because they offered stylish looks with quality and was famous for its fashion status, colour and combinations. While Adidas is known for its good quality and comfort goods and Reebok for its stylish look or 'hip hop' style. And therefore it seemed impossible for two brands to compete with Nike independently. Moreover, Adidas aimed to extend their global reach by aiming to expand in Asia market and to generate more revenue from Asia market. It seemed to succeed as the sales revenue from Asia market improved. In 2005 sales from Asia contributed 22.95 percent of the group total revenue which increased to 24.65 percent in 2008.

Yet another advantage was that the group aimed to reduce its annual cost and wanted to save around \$ 125 million annually with substantial operational synergies and expected to increase revenue and profit from complete coverage of all consumer segments.

However, company's main aim to compete with Nike in North America market didn't hit the target, as the revenue generated from North America went down. Although in 2006 group revenue from North America increased significantly from \$ 1561 million in 2005 to \$ 3234 million in 2006 i.e. 107 percent growth, but this was mainly due to 2006 FIFA world cup and group revenue from North America declined thereafter. Other shortfall of the acquisition can be seen from the declined sales revenue of Reebok. Reebok sales went down by 9 percent in 2006 i.e. from \$ 2718 million in 2005 to \$ 2473 million in 2006.

Answer the following questions :

- Why did Adidas wanted to merge with Reebok?
- What were the positive aspects of merger of Adidas and Reebok?
- What were the negative aspects of merger discussed in the above case?

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8. Discuss following :

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- a. Single Electron Transistor
- b. Magnetic force microscope.

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Total No. of Pages : 01

M.Tech. (ECE) (Sem.-2)

SATELLITE COMMUNICATION

Subject Code : MTEC-PE3A-18

M.Code : 76261

Date of Examination : 15-05-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT questions.**
2. Each question carries TWELVE marks.

1. a) Draw the block diagram for satellite communication system. Explain the function of each block. (6)
b) Explain three Kepler's laws of planetary motion. (6)
2. a) Derive the expression for the time period of satellite's orbit. (6)
b) Compare the low earth orbit and geostationary satellite systems. (6)
3. a) What are the various subsystems in the satellite? Explain the power system. (6)
b) What is Doppler frequency shift? Derive the expression for it. (6)
4. a) Discuss various modulation and multiplexing techniques used with satellite links. (8)
b) Explain the architecture of a satellite communication system. (4)
5. a) Explain the TTC&M satellite subsystem with a neat diagram. (6)
b) Explain the Altitude and Orbit Control System (AOCS) with necessary diagram. (6)
6. a) Derive the expression for system noise temperature of a satellite link. (6)
b) Compare FDMA, TDMA and CDMA techniques. (6)
7. a) Explain DBS-TV. (6)
b) Explain how satellite telephony is implemented by using LEO. (6)
8. a) Explain in detail GPS position location principles. (6)
b) Explain the multiple access technique distinguished with respect to time that is used in satellite communication systems. (6)

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Total No. of Pages : 02

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M.Tech. (ECE) (Sem.-2)

ANTENNAS AND RADIATING SYSTEMS

Subject Code : MTEC/103/18

M.Code : 76259

Date of Examination : 08-05-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT question.
2. Each question carry TWELVE marks.

1.
 - a) Derive an expression for the far field component of a half wave dipole antenna.
 - b) With the help of proper mathematical expressions, explain how single wire antenna radiate?
2.
 - a) Consider a circular loop antenna of radius 0.25 m carrying a current of 10 A at 7.5 MHz and is symmetrically placed in the x-y plane at the origin. Determine total power radiated and the magnitude of the electric field intensity in the x-y plane at a distance of 10 km.
 - b) Explain how the performance of single wire antenna depends on Ground effects.
3. Consider a broad side antenna array of n elements. Each antenna element carries current of equal amplitude and phase. If the distance between each element is ' d ' then derive the expression for the direction of pattern maxima, pattern minima and beam width of major lobe.
4.
 - a) With the help of a suitable example, explain the Dolph - Tchebyscheff method of optimization for a linear broadside array.
 - b) Explain the principle of Pattern multiplication.
5.
 - a) With the help of proper mathematical expressions and diagram, explain the radiation mechanism from a rectangular aperture antenna.
 - b) Derive the field components radiated from a thin slot antenna in an infinite cylinder.



6. a) What is Horn antenna? Explain the special features of various types of Horn antennas.
b) Explain the basic characteristics and feeding mechanism of Micro strip antenna.
7. Explain parabolic reflector on the basis of design consideration, working principle, directivity, Gain and efficiency.
8. **Write short notes on :**
 - a) Antenna parameters like Radiation Power Density, Directivity and Gain.
 - b) Polarization.
 - c) End fire antenna array.

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