

Code No.

M – 2939

Ph.D. ENTRANCE EXAMINATION, DECEMBER 2021

Time : 3 Hours

Max. Marks : 100

Instructions :

- 1) Answer **any ten** questions each from Part **A** and **B**.
- 2) Each question carries **five** marks.
- 3) Candidates should clearly indicate the **Part, Question Number** and **Question Booklet Code** in the answer booklet.
- 4) The candidates are **permitted** to answer questions **only** from the subject that comes under the **faculty** in which he/she seeks registration as indicated in the **application** form.

Name of candidate

Register Number

Answer Booklet Code

Signature of Candidate

Signature of Invigilator

FACULTY OF ENGINEERING AND TECHNOLOGY

1. Computer Science and Engineering
2. Electrical and Electronics Engineering
3. Electronics and Communication Engineering
4. Mechanical Engineering

1. Computer Science and Engineering

Part – A

Research Methodology

- I. Answer any **ten** questions :
1. Describe the different types of research and clearly point out the difference between experimental work and a survey.
 2. Explain the purpose of the literature survey and analysis of the literature.
 3. What are the various criteria to be satisfied by scientific research?
 4. Infer the importance of ethics in research.
 5. Explain the technique involved in defining a problem.
 6. Illustrate the various methods of collecting primary data.
 7. What is hypothesis testing? Explain the procedure for hypothesis testing.
 8. Describe some of the research designs used in the experimental hypothesis-testing research study.
 9. What are the contents should be comprised in a comprehensive layout of the research report? Elaborate your answer.
 10. Explain the consequence of plagiarism with a suitable example of your choice.
 11. What are the importance of citations and acknowledgment? Elaborate your answer with an example.
 12. Explain the various steps involved in regression analysis with a suitable example.
 13. Briefly explain the characteristics and applications of multivariate analysis.
 14. Explain the significance of the research report and narrate the various steps involved in writing such a report.
 15. What are the components of a doctoral dissertation? Describe.

(10 × 5 = 50 Marks)

Part – B

Computer Science and Engineering

II. Answer any **ten** questions :

1. Explain the different types of functional units in a computer.
2. What are addressing modes? Explain various addressing modes with example.
3. Compare and contrast the features of a single-pass compiler with multi-pass compiler.
4. Give any two examples for strength reduction of operations.
5. Illustrate various mapping techniques used in cache memories.
6. Describe the scope and storage allocation of variables
7. Compare and contrast linked list and linear array representation of a data structure.
8. Explain the NP-Hard and NP-Complete with suitable examples.
9. Compare Multiprocessor Systems and Distributed Systems.
10. Discuss critical section problem in detail.
11. Summarize Dining-Philosophers problem.
12. Illustrate how the guided media differs from unguided media? Briefly explain any two methods of data transmission using guided media and any two methods of data transmission using unguided media?
13. Sketch the OSI model and explain the functions of the layers that handle the following situations: Network Layer, Transport Layer and Session layer.
14. Discuss in detail about the data pre-processing concepts.
15. Explain the concept of Association rule mining.

(10 × 5 = 50 Marks)

2. Electrical and Electronics Engineering

Part – A

Research Methodology

- I. Answer any **ten** questions :
1. Describe the different steps involved in a research process.
 2. Explain why literature survey is an important step in the research process.
 3. Write notes on any search specific search engine (say Google Scholar) to search for scholarly articles.
 4. Explain the use of any reference manager tool.
 5. State few qualities of good research.
 6. Distinguish between research methods and research methodology.
 7. Explain the meaning and significance of a research design.
 8. Explain simple random sampling.
 9. Find the mean, median and mode for the numbers 1,2,3,...10.
 10. Explain the requirement of a measure of dispersion.
 11. Give examples of univariate, bivariate and multivariate population.
 12. With the help of figures explain positive skewness and negative skewness.
 13. How do you find sample mean and sample variance?
 14. What is a hypothesis?
 15. What are the characteristics of a good research report?

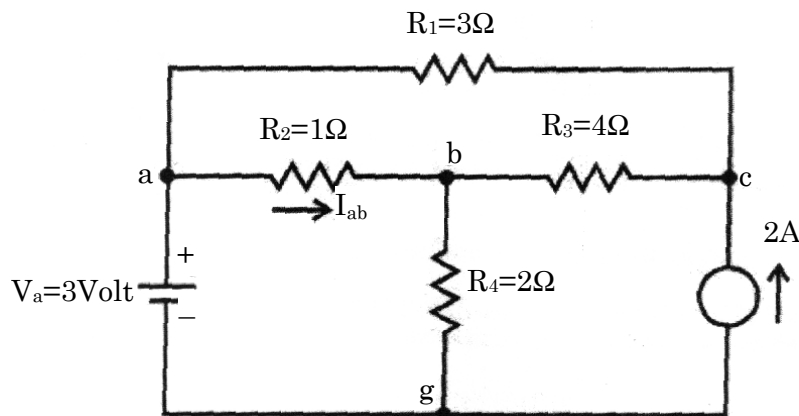
(10 × 5 = 50 Marks)

Part – B

Electrical and Electronics Engineering

II. Answer any **ten** questions :

1. When do we say a system is linear? Give examples of nonlinear systems.
2. Why is power transmitted at high voltages?
3. Find I_{ab} in the circuit given below using superposition theorem.



4. Consider a PMMC ammeter, sketch the step response if the meter is under damped. Also sketch the step response if the meter is over damped. (Assume current to be the input and deflection to be the output)
5. What is the difference between synchronous and asynchronous counter.

6. Consider a system of five linear equations in five variables. Does this system of equation always have a unique solution? Explain.
7. Give a set of two equation which has infinite number of solutions.
8. When we study transient response of electric circuits, circuit is represented by differential equation. Why?
9. Explain the need for starters in a dc-motor.
10. Explain the principle of operation of a single phase transformer with the help of vector diagrams.
11. Why is single phase induction motor not self-starting?
12. Write the following number 19 in binary form and hexa-decimal form.
13. Write a transfer function of a stable linear system and mark the poles and zeroes on the s-plane.
14. Explain the steps involved in solving a differential equation using Laplace Transforms. Illustrate the steps by considering a suitable example.
15. With help of diagram explain how a 0-1A ammeter can be converted to 0 to 10 A ammeter.

(10 × 5 = 50 Marks)

3. Electronics and Communication Engineering

Part – A

Research Methodology

- I. Answer any **ten** questions :
1. Explain the different steps involved in the process of research.
2. What do you mean by the term hypothesis? What are the characteristics of a good hypothesis?
3. What is meant by stratified random sampling?
4. Explain the importance of literature review while doing research.
5. List out the examples of the online tools that enable you to create citations very easily and effectively.
6. What do you mean by factor analysis?
7. Explain your own point of view of research.
8. What are the factors to be considered in the preparation of a thesis report?
9. What is meant by mathematical modeling?
10. What are the different types of reasoning?
11. The term, 'controlled group' is used in which type of research. Explain.
12. What is correlation-coefficient? What is its importance?
13. Distinguish between deterministic and stochastic systems.
14. Explain Intellectual Property Rights.
15. Discuss about the ethics in research.

(10 × 5 = 50 Marks)

Part – B

Electronics and Communication Engineering

II. Answer any **ten** questions :

1. Auto correlation can be used to detect a noisy signal. Is this statement true? Justify your answer.
2. Is there any limitation in using Fourier transform for the analysis of non-stationary signals? Justify your answer.
3. List out the properties of the cumulative distribution function of a random variable.
4. Let the random process $X(t)$ be the input to a linear system L with output process $Y(t)$. Find the mean function of the output, if the mean function of input is $m(t)$.
5. The white noise observed in most practical systems are modelled as Gaussian. Why?
6. What do you mean by delta modulation?
7. What is the use of derivative filters in image processing? Write down the impulse response of a typical derivative filter?
8. For an amplifier circuit, what are the ideal values of the input impedance and output impedance. Justify your answer.
9. Discuss the significance of the maximum power transfer theorem.
10. Draw the frequency response of the ideal low pass filter, high pass filter, band pass filter and band stop filter.
11. What do you mean by resonance in electric circuits? What are its implications?
12. Illustrate how we can use a multiplexer to realize a combinational circuit.
13. What do you mean by a half wave dipole antenna?
14. Discuss the concept of poles and zeros.
15. Can we use RC coupled amplifiers for amplifying microwave frequency signals? Justify your answer. If not possible, suggest an alternative.

(10 × 5 = 50 Marks)

4. Mechanical Engineering

Part – A

Research Methodology

- I. Answer any **ten** questions :
1. What are the ingredients to define research?
 2. Give an overview of the research procedure with the help of a flow chart.
 3. Write a comprehensive note on the task of formulating a research problem by literature review.
 4. How do the researchers do the formulation of research methods?
 5. Briefly discuss the various steps involved in writing a research report.
 6. Distinguish between abstract and conclusion in a research paper.
 7. What are the important points to be considered as part of professional ethics in your role as a research scholar?
 8. What is a hypothesis? What characteristics it must possess in order to be a good research hypothesis?
 9. Explain the difference between qualitative and quantitative research.
 10. Discuss the selection of appropriate method for research data collection.
 11. Describe the role of mathematical modeling in research with a simple example.
 12. What is creative thinking? How can **it** be useful in research?
 13. Discuss the different ways in which one can communicate the research findings.
 14. What is :
 - (a) Skewness and
 - (b) Kurtosis of a data set?
 15. Why tabulation is considered essential in research study?

(10 × 5 = 50 Marks)

Part – B

Mechanical Engineering

II. Answer any **ten** questions :

1. What do you mean by stress at a point? How will you determine the principal stresses for a 3D state of stress?
2. How do you construct Mohr's circle for a 2D stress state?
3. Explain the principle of virtual work.
4. Distinguish between isotropic materials and orthotropic materials.
5. What do you understand by high grade energy and low grade energy? Give examples.
6. All spontaneous processes are irreversible. Explain.
7. What is meant by natural frequency? Obtain the expression for natural frequency of a simple pendulum.
8. Define specific speed of a turbine. What is its significance?
9. Using T-s and p-h diagram, explain simple vapor compression refrigeration cycle.
10. What are Gantt Charts? How can it be constructed?
11. Write down the expressions for the physical laws that govern each mode of heat transfer, and identify the variables involved in each relation.
12. State and explain Newton's law of viscosity.
13. Briefly explain the performance characteristics of a reaction turbine.
14. What is Venturimeter? Explain its principle.
15. What is additive manufacturing technology? Explain the working principle.

(10 × 5 = 50 Marks)

ROUGH WORK

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