*Total No. of Questions: 6* *Total No. of Printed Pages:3*

**Enrollment No.....**

# Faculty of Engineering

## End Sem (Even) Examination May-2022

## EN6RD01 Research Methodology

Programme: Ph.D. Branch/Specialisation: All (Course Work).

**Duration: 3 Hrs.** **Maximum Marks: 60**

Note: 1. All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.
2. Use of Statistical Tables is allowed.

Q.1 i. Literature review requires: **1**
(a) Planning (b) Clarity (c) Focus (d) All of these

ii. A test conducted under controlled conditions to demonstrate a known truth is: **1**
(a) Survey (b) Interview (c) Experiment (d) All of these

iii. Which is the only measure for nominal data **1**
(a) Mode (b) Median (c) Mean (d) Variance

iv. Measure of volatility in the data is **1**
(a) Variance (b) Mean
(c) Coefficient of correlation (d) All of these

v. Which distribution is used to model the waiting time at some bank counter: **1**
(a) Binomial Distribution (b) Hyper geometric Distribution
(c) Uniform Distribution (d) Exponential Distribution

vi. In poission distribution, trials are: **1**
(a) Dependent (b) Independent
(c) Doesn't matter (d) None of these

vii. A type I error occurs when: **1**
(a) The null hypothesis is incorrectly accepted when it is false
(b) The null hypothesis is incorrectly rejected when it is true
(c) The sample mean differs from the population mean
(d) The test is biased

P.T.O.

viii. A one-tail test is one where: **1**
(a) Results in only one direction can lead to rejection of the null hypothesis
(b) Results in either of two directions can lead to rejection of the null hypothesis
(c) No results lead to the rejection of the null hypothesis
(d) None of these

ix. Simulation is: **1**
(a) Experiment on model (b) Experiment on real world
(c) Description of state of affairs (d) None of these

x. Genetic algorithm is: **1**
(a) Population based search (b) Point based search
(c) Based on calculus (d) Not a metaheuristic algorithm

Q.2 i. Define research. **2**

ii. Explain positivist and interpretivist approaches in research. **3**

iii. Explain the following research types **5**
(a) Qualitative Research (b) Quantitative Research

OR iv. Give a detailed description of research process. **5**

Q.3 i. Explain the role of statistics in research. **2**

ii. Explain linear regression analysis for two variables. **8**

OR iii. Frequency Distribution of the monthly income of customers in a locality is presented in the Table 1. Determine the arithmetic mean and standard deviation.

Table 1

| **Monthly Salary (Rs.)** | **Number of employees** | **Monthly Salary (Rs.)** | **Number of employees** |
|---|---|---|---|
| 4000-8000 | 120 | 20000-24000 | 240 |
| 8000-12000 | 150 | 24000-28000 | 185 |
| 12000-16000 | 175 | 28000-32000 | 130 |
| 16000-20000 | 250 | 32000-36000 | 70 |



Q.4 i. The arrival rate of customers at a bank counter follows Poisson distribution with a mean arrival rate of 5 per 10 minutes. Find the probability that 4
(a) Exactly 2 customers will arrive in 10 minutes
(b) At least 2 customers will arrive in 10 minutes.

ii. Explain with the help of suitable example that exponential distribution is memoryless. 6

OR iii For a normal distribution with mean = 45 and standard deviation = 3.5. Find the probability that the 6
(a) Value is less than 30
(b) Value is greater than 45
(c) Value lies between 35 and 45.

Q.5 i. Define the terms **4**
(a) Confidence Interval (b) Significance Level
(c) Type-I error (d) Type-II error

ii. The mean of a certain production process is known to be 50 with a standard deviation of 2.5. The production manager may welcome any change is mean value towards higher side but would like to safeguard against decreasing values of mean. He takes a sample of 12 items that gives a mean value of 48.5. What inference should the manager take for the production process on the basis of sample results? Use 5 per cent level of significance for the purpose. **6**

OR iii. Define power of test. Explain the steps of hypothesis testing. **6**

Q.6 Attempt any two:

i. Define soft computing and state its characteristics and applications. Compare and contrast hard and soft computing. **5**

ii. Write a note on Genetic algorithm. **5**

iii. Draw the diagram of a single layer neural network and explain its operation. **5**
The input to a single input neuron is 2.0, its weight is 2.3 and its bias is -3. What is the output of the neuron if it has the following activation functions?
(a) Sigmoidal (b) Linear

******

Research Methodology (EN6RD01)

Model Scheme

Q1.

1 D

2 C

3 A

4 A

5 D

6 B

7 B

8 A

9 A

10 A

Q2. 1 Clear and precise definition 2 marks

2. Explanation of both viewpoints with one suitable example of each 3 marks

3. Basic definition 2 marks

Features and difference 3 marks

4. Listing of steps 1 mark

Block diagram 2 marks

Briefing of each step ¼ to ½ marks each

Q3. 1. Importance of statistics in research in clear and precise words 2 marks

2. Explanation: 2 marks

Derivation: 4 marks

Figure and formulae: 2 marks

3. Formulae: 2 marks

Solution: mean =19348.4848; 3 marks

Standard deviation: =7765.4878; 3 marks

4. a P(X=2)= 0.08422 2 marks

P(x>=2)= 0.95957 2 marks

b Justify that the exponential distribution is memory less with suitable example 6 marks

c. P(X<30) = 0.00001 2 marks

P(X>45)= 0.5 2 marks

P(35<x<45)= 0.99786-0.5=0.49786 2 marks

5. I clear and precise definitions 1 mark each

Ii z= -2.0784

Zc= -1.645

Reject null hypothesis

Iii Power of a test 3 marks

Steps of hypothesis testing 3 marks

6 1 Definition : 1 mark

Characteristics 2 marks

Comparison 2 marks

2. Algorithm, flowchart, features, and characteristics: 1.25 marks each

3. NN sigmoid 0.8320

Linear 1.6 2.5 marks each