

BE INFO TECH 2<sup>nd</sup> YEAR 2<sup>nd</sup> SEMESTER EXAMINATION, 2022

Time: 3 Hours

Mathematics for IT - II

Full Marks: 100

Answer All Questions

1. a) State Bay's Rule. With a Relevant Numerical Example, explain Bay's Rule.

b) Study the following story of a Biased Random Number Generator.

The Random Number Generator generates any integer  $X$  whose value is anywhere from 1 to 10. Since this Generator is biased, it gives out even numbers more frequently than the odd numbers. In fact, after a careful study it was noticed that, the probability of generating an even integer by the generator is just twice the probability of generating an odd integer.

What is the Expected Value and Standard Deviation of  $X$ ?

c) The amount of time a Postal Clerk spends with his Customer is a Random Variable ( $X$ ) and it follows Exponential Distribution. It was also measured that Average Time the Postal Clerk spends with his customer ( $\mu$ ) is 4 minutes. What is the probability that A Certain Postal Clerk will spend more than 7 minutes with his customer? Show all the intermediate steps. It is to be noted that in Exponential Distribution, Rate Parameter is always  $(1/\mu)$ .

((1+4)+(3+3)+5)

2. a) In a certain study, the height of several children recorded was 93, 98, 90, 87, 93, 91, 95, 93, 97 and 95 centimeter. Find Mean, Median, Mode, Range, Variance and Standard Deviation for this height distribution.

b) Give a numerical example of a Data Distribution where Skewness is Positive.

c) Give a numerical example of a Data Distribution where Skewness is Negative.

d) In a certain study, the weight of certain kind of fish recorded was 90, 92, 89, 91, 93, 90, 87, 91, 90, 89, 88, 94 and 86 grams. Identify the type of Kurtosis for this kind of weight distribution.

(6+2+2+2)

3. a) In a class of 100 students it was found for the Examination of Mathematics that the average mark was 70 and the standard deviation was 10. How many people got less than 64? Show all the intermediate steps. If necessary, you can use the following Z-Score table.

z-score value:	Area between the mean and z:	Area beyond z:
1.58	0.4429	0.0571
1.59	0.4441	0.0559
1.6	0.4452	0.0548
1.61	0.4463	0.0537
1.62	0.4474	0.0526
1.63	0.4484	0.0516
1.64	0.4495	0.0505
→ 1.65	0.4505	→ 0.0495
1.66	0.4515	0.0485
1.67	0.4525	0.0475
1.68	0.4535	0.0465
1.69	0.4545	0.0455
1.7	0.4554	0.0446
1.71	0.4564	0.0436

- b) In the last Higher Secondary Exam, Ramesh got 75 in the subject of Physics and also 75 in the subject of Chemistry. The Average Marks for Physics and Chemistry were 85 and 80 respectively. In addition to that, the Standard Deviation was 8 and 10 for Physics and Chemistry respectively. Out of these two subjects, in which Ramesh did better than the other? Show all the intermediate steps.
- c) A 2017 study revealed that 11% of Urban Population is Diabetic in India. To confirm this fact certain Marketing Research Group wanted to draw samples from different cities in India. What should be the sample size to accomplish this? Elaborate the Principles associated with this.
- d) For the scenario mentioned in 3b, what should be the sample size to keep the Standard Error less than 2%? Elaborate the Principles associated with this.  
(3+3+3+3)
4. a) Using proper Numerical Example, Explain the concepts of Sample Distribution of a Mean, Standard Error of the Mean and Mean Squared Error.
- b) Using proper Numerical Example, Explain the concepts of Maximum Likelihood Principles and Estimation.  
(6+6)
5. a) Using relevant Payoff Matrix, explain Zero-Sum-Game, Pure Strategy, Minimax Criterion, Value of the Game, Equilibrium and Saddle Point. Please use Numerical Examples as much as possible.

- b) Using relevant Payoff Matrix, explain Mixed-Strategy-Game. Also, calculate expected outcome for both the parties. Please use Numerical Examples as much as possible. (6+6)
6. a) Explain in Details about Inventory Classification from various Point of Views.  
 b) With proper diagrams, explain, EOQ-I Inventory Model. (6+6)
7. a) List and explain the Five Components of a Queueing System.  
 b) Explain all the Components of a Queueing Notations. (6+6)
8. a) Explain Project Life Cycle.  
 b) Study the below Activity List for a certain Project. Develop an AON for this Project. Identify the Critical Path and Compute the Project Completion Time.

Activity Name	Immediate Predecessor	Duration ( in Weeks )
T1		8
T2	T2	3
T3	T1	6
T4	T1, T3	3
T5	T2	6
T6	T5	7
T7	T3, T6	7

- c) Now, modify the above Diagram by adding the ES, EF, LS, LF information.
- d) Now, Calculate the Slack and add this information as another column to the Table mentioned above. (3+3+3+3)

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