JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY
Mid Term-I Examination, August 2024
B. Tech., Odd Semester, 2024-25

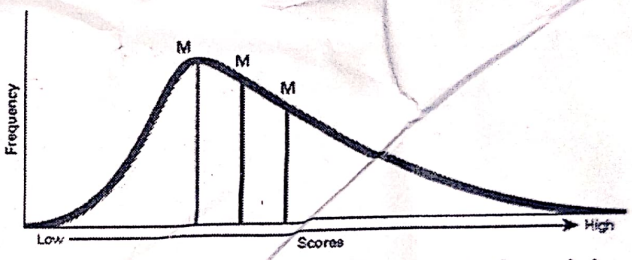
Roll No. 2023BTECH039.....

AS1117: Probability and Statistics | Time: 1.5 hours | Max. Marks: 15

Instructions to students:
1. Do not write anything other than your roll number on the question paper.
2. You may use non-programmable scientific calculator.
3. Specify, if you find any ambiguity in the questions. Justify and solve the question after removing that ambiguity.

Q. 1 If $P(X) = 0.24, P(Y) = 0.75$, and $P(X \cup Y) = 0.81$, are X and Y independent? 1.0 *(CO2)*

Q. 2 Examine the distribution of data presented in the graph and determine the type of skewness present. Identify and mark the positions of the mean, median, and mode on the graph. 1.0 *(CO2)*



Q. 3 A survey for a certain year found that 91% of pregnant women received medical care before giving birth. Of these women, 70% received medical care from doctors, while 30% received medical care from other healthcare providers. 1.0 *(CO2)*

What is the probability that a pregnant woman who received medical care before giving birth was taken care by a doctor?

Q. 4 A researcher observes driving behavior on a roadway, noting the gender of the drivers, the types of vehicles driven, and the speeds at which they are traveling. The researcher wants to organize the data in graphs. Suggest the following: 2.0 *(CO2)*
a) Which type of graph(s) should be used to describe each variable?
b) What is an appropriate measure of central tendency to calculate for each data type?

Variable/Attribute	Graph(s)	Measure of central tendency

Q. 5 A large meat processor has measured the weight (in grams) of the meat in a pizza product for a sample of 20 packages. The following are the ordered weights, courtesy of Dave Brauch: 3.0 *(CO2)*

16.12, 16.77, 16.87, 16.91, 16.96, 16.99, 17.02, 17.19, 17.20, 17.26,
17.36, 17.39, 17.39, 17.62, 17.63, 17.76, 17.85, 17.86, 17.91, 19.00.

Draw a modified boxplot (which may indicate potential outliers) to visually represent the distribution of the weights. Write the outliers, if those are identified in the plot.

Q. 6 An incomplete frequency distribution is given as follows: 2.0 (CO2)

Variable	Frequency	Variable	Frequency
[10, 20)	12	[50, 60)	46
[20, 30)	30	[60, 70)	25
[30, 40)	?	[70, 80)	18
[40, 50)	65	Total	230

Determine the missing frequencies using **the Median formula** given that the median value is 46. (Here, you will be able to validate your answer!)

Q. 7 A drug is used to maintain a steady heart rate in patients who have suffered a mild heart attack. There are two such drugs: an older drug (A) and a new drug (B). Both drugs were tested on 100 patients. Suppose x denotes the number of heartbeats per minute. $f_1(x)$ and $f_2(x)$ denote the number of patients who received drugs A and B, respectively. 2.0 (CO2)

x	40	60	68	70	72	80	100
$f_1(x)$	1	4	5	80	5	4	1
$f_2(x)$	40	5	4	2	4	5	40

a) What are the average heart rates of the patients receiving the drug A and B, respectively?
b) Given that $\sum f_1(x-\mu_1)^2 = 2640$ and $\sum f_2(x-\mu_2)^2 = 76160$, what are the standard deviations for the above heartbeats data for both the drugs?
c) Based on the above two results, compare which drug type is more efficient? Justify.

Q. 8 During a power blackout, one hundred persons are arrested on suspicion of looting. Each is given a polygraph test. From past experience, it is known that the polygraph is 90% reliable when administered to a guilty suspect and 98% reliable when given to someone innocent. Suppose that of the one hundred persons taken into custody, only twelve were involved in any wrongdoing. What is the probability that a given suspect is innocent given that the polygraph says he is guilty? 3.0 (CO2)