

Jaypee University of Information Technology, Waknaghat

Test-III Examination - December 2021

B.Tech (CS/IT)

Course Title: Probability & Statistics

Max. Marks: 35 marks

Course Code: 18B11MA313

Semester: III

Max. Time: 2 hours

Note: Answer all the questions. Describe random variables along with range where applicable. Scientific calculators are allowed.

- Of the three men, the chances that a politician, a businessman and an academician will be appointed as a vice-chancellor (VC) of a university are 0.50, 0.30 and 0.20 respectively. Probability that research is promoted by these people if they are appointed as VC are 0.3, 0.7 and 0.8 respectively. (3 Marks) [CO-1]
 - Determine the probability that research is promoted in the university.
 - If research is promoted in the university, what is the probability that the VC is an academician?
 - If research is promoted in the university, what is the probability that the VC is a businessman?
- Consider the probability density function of a random variable X :

$$f_X(x) = \begin{cases} k(x+3) & , 2 < x < 8 \\ 0 & , \text{else} \end{cases}$$

Find

(4 Marks) [CO-2]

- $\mathbb{P}(3 < X < 5)$
 - $\mathbb{P}(X \geq 4)$
 - $\mathbb{P}(|X - 5| < 0.5)$
- Given the following bivariate probability distribution, obtain (4 Marks) [CO-2]
 - marginal distribution of Y
 - the conditional distribution of X given $Y = 2$

$Y \downarrow, X \rightarrow$	-1	0	1
0	1/15	2/15	1/15
1	3/15	2/15	1/15
2	2/15	1/15	2/15

- If the sum of the mean and variance of binomial distribution of 5 trials is 4.8, find the distribution. (4 Marks) [CO-3]
- Fit a Poisson distribution on the following data: (5 Marks) [CO-4]

x	0	1	2	3	4
y	192	100	24	3	1

6. Find the best *least squares fit* to the data by a quadratic polynomial. (5 Marks) [CO-4]

x	-1	0	1	2
y	2	5	3	0

7. The average IQ of the adult population is 100. A researcher believes the average IQ of adults is lower than 100. A random sample of 5 adults are tested and scored 69, 79, 89, 99, 109 with a standard deviation of 15.81. (5 Marks) [CO-5]

(a) State *null* and *alternative* hypotheses.

(b) Is there enough evidence to suggest the average IQ is lower at $\alpha = 0.05$?

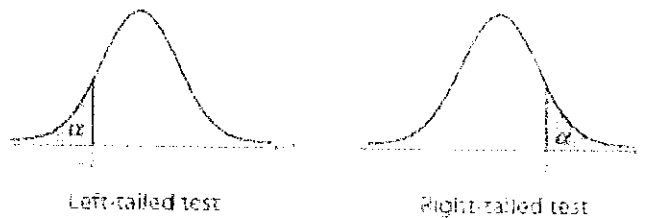
8. A study of iron deficiency among infants compared samples of infants following different feeding regimens. One group contained breast-fed infants, while the children in another group were fed a standard baby formula without any iron supplements. Here are summary results on blood hemoglobin levels at 12 months of age: (5 Marks) [CO-5]

Group	n	\bar{x}	s
Breast-fed	23	13.30	1.7
Formula	19	12.40	1.8

(a) What you think should be the *null* and *alternative* hypotheses?

(b) Is there significant evidence that the mean hemoglobin level is higher among breast-fed babies? Use $\alpha = 5\%$ with $t_{\alpha} = 1.645$. Assume equal population variances.

Student's t-Distribution:



d.f.	Level of confidence, c						
	0.50	0.80	0.90	0.95	0.98	0.99	
	One tail, α						
	0.25	0.10	0.05	0.025	0.01	0.005	
	Two tails, α						
	0.50	0.20	0.10	0.05	0.02	0.01	
1	1.000	3.078	6.314	12.706	31.821	63.657	
2	.816	1.886	2.920	4.303	6.965	9.925	
3	.765	1.638	2.353	3.182	4.541	5.841	
4	.741	1.533	2.132	2.776	3.747	4.604	
5	.727	1.476	2.015	2.571	3.365	4.032	
6	.718	1.440	1.943	2.447	3.143	3.707	
7	.711	1.415	1.895	2.365	2.998	3.499	
8	.706	1.397	1.860	2.306	2.896	3.355	
9	.703	1.383	1.833	2.262	2.821	3.250	
10	.700	1.372	1.812	2.228	2.764	3.169	
11	.697	1.363	1.796	2.201	2.718	3.106	
12	.695	1.356	1.782	2.179	2.681	3.055	
13	.694	1.350	1.771	2.160	2.650	3.012	
14	.692	1.345	1.761	2.145	2.624	2.977	
15	.691	1.341	1.753	2.131	2.602	2.947	