

**JK LAKSHMIPAT UNIVERSITY
JAIPUR
Pre- Ph. D EXAMINATION**

Programme: Ph.D

Course: Statistics for Research

MM: 40 Marks

Time: 2 Hours

- Note:** 1. You may use a calculator, but use of laptop or phone is not permitted.
2. The examination is open book, open notes. You may also refer statistical tables for calculation.

Part A: Basic Concept (Total Marks – 10)

1. If the two regression coefficients are 0.8 and 0.2, what would be the value of coefficient of correlation
 - a. $r = 0.4$
 - b. $r = 0.1$
 - c. $r = 0.16$
 - d. $r = 4$
2. If S is the set of exhaustive events, then:
 - a. $0 < P(S) < 1$
 - b. $P(S) = 1$
 - c. $P(S) = 0$
 - d. $P(S) > 0$
3. If X is a discrete random variable in the interval $-2 \leq X \leq 2$, then the possible values that X can assume are:
 - a. -2, -1, 0, 1 and 2
 - b. -2 and 2
 - c. -1, 0, 1 and 2
 - d. -1, 0 and 1
4. The mean of five observations 1, 2, 6, x_4 and x_5 is 4.4 and $x_4 - x_5 = 5$, the values of x_4 and x_5 are:
 - a. 9 and 4
 - b. 8.5 and 3.5
 - c. 7.5 and 4.5
 - d. None
5. If X is a normal random variable with mean μ and variance 9 and Z is standardized normal random variable such that $P(X = 15) = P(Z = 1)$, then the value of mean is:
 - a. 0
 - b. 12
 - c. 15
 - d. 8
6. From a partially destroyed record, it is observed that $\bar{x} = 518$, $\mu = 500$, $S = 40$ and calculated t value is 2.25, then the sample size is:
 - a. 25
 - b. 50
 - c. 36
 - d. 625
7. By judging an innocent defendant as a convict, the error committed by the judge is:
 - a. Type I Error
 - b. Type II Error
 - c. Sampling Error
 - d. None
8. Which of the following is not a component of time series
 - a. Smoothing
 - b. Trend
 - c. Seasonal Variation
 - d. Irregular Fluctuation
9. A restaurant has been experiencing higher sales during the weekends as compared to the weekdays. Daily restaurant sales patterns for this restaurant over a week are an example of the of time series.
 - a. Trend
 - b. Seasonal
 - c. Cyclical
 - d. Irregular
10. Maximin is a criterion used when making decision under
 - a. Certainty
 - b. Uncertainty
 - c. Risk
 - d. The threat of bankruptcy

Part B: Problems and Conceptual Understanding (Total Marks – 20)
(Attempt any 4 questions)

1. From the following two sample values find out whether they have come from the same population, using equality of means ($\alpha = 0.05$).

Sample 1	17	27	18	25	27	29	27	23	17
Sample 2	16	16	20	16	20	17	15	21	

2. 500 students at school were graded according to their intelligences and economic conditions of their homes. Examine whether there is any association between economic condition and intelligence, from the following data ($\alpha = 0.05$):

Economic Conditions	Intelligence	
	Good	Bad
Rich	85	75
Poor	165	175

3. The two regression equations of the variables x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$. Find the correlation coefficient between x and y .
4. Does the presence of small numbers of weeds reduce the yield of corn? Lamb's quarter is a common weed in corn fields. A researcher planted corn at the same rate in 8 small plots of ground, and then weeded the corn rows by hand to allow no weeds in 4 randomly selected plots and exactly 3 lamb's-quarter plants per meter of row in the other 4 plots. Here are the yields of corn (bushels per acre) in each of the plots:

Weeds per minute	Yield (bushels/acre)			
0	166.7	172.2	165.0	176.9
3	158.6	176.4	153.1	156.0

The samples are too small to assess normality adequately or to rely on the robustness of the two-sample test ($\alpha = 0.10$). We may prefer to use a test that does not require normality.

5. An undesirable effect of some antihistamines is drowsiness, which is a consequence of the effect of the drugs on the central nervous system. These data come from an experiment of Hedges, Hills, Maclay, Newman-Taylor and Turner (1971) to compare the effect on the central nervous system of a placebo and two antihistamines. This was done by measuring the flicker frequency sometime after drug administration in four volunteers who have taken the three treatments. The data presented here are scaled measures based on the flicker frequency.

Subject Number	Meclastine	Promethazine	Placebo
1	112	112	131
2	48	37	61
3	106	93	112
4	51	46	70

Carry out an appropriate analysis to examine whether there is a difference between the effects of the different drugs, stating clearly your hypotheses, conclusions and any assumptions made ($\alpha = 0.05$).

Part C: Analytical Ability and Situational Analysis (Total Marks – 10)

1. The comptroller of the Macrosoft Corporation has \$ 100 million of excess funds to invest. She has been instructed to invest the entire amount for one year in either stocks or bonds (but not both) and then to invest the entire fund in either stock or bonds (but not both) for one year more. The objective is to maximize the expected monetary value of the total fund at the end of the second year. The annual rates of return on these investments depend on the economic environment, as shown in the following table:

Economic Environment	Rate of Return	
	Stocks	Bonds
Growth	20%	5%
Recession	-10%	10%
Depression	-50%	20%

The probability of growth, recession, and depression for the first year are 0.7, 0.3, and 0, respectively. If growth occurs in the first year, these probabilities remain the same for the second year. However, if a recession occurs in the first year, these probabilities change to 0.2, 0.7, and 0.1, respectively, for the second year.

- (a) Construct Payoff table and find EVPI for the first year.
(b) Construct the decision tree for the entire problem (based on two years) by hand.