INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

M.Tech (Marine Engineering & Management)

May-June 2018 End Semester Examination

Semester-II

Statistics for Business Managers (PG13T1106)

Date:31-05-2018   **Maximum Marks: 100**

Time: 3 Hrs   **Pass Marks: 50**

Note: Answer any FIVE questions. All questions carry equal marks.

(5 x 20 =100)

1. (a) Define the regression coefficients Y on X and X on Y for the bivariate variables X and Y.

   (b) Two estimated regression equations are given below.

      X – 7Y -13 = 0

      5X -2Y -14 = 0

   Identify the regression equations Y on X and X on Y with appropriate arguments. Examine the both possibilities.

   (c) If the standard deviation of X is known to be 2, then determine the standard deviation of Y using the information in 2(b).

   (d) Define the multiple correlation coefficient.

   (e) Define the adjusted multiple correlation coefficient.

2. In a PG engineering examination, scores (X) out of 100 marks are having a normal distribution with mean score μ = 55.86 and unknown standard deviation σ. It is further known that 10% of students get marks 80 or more. [Given P (Z-score = $(X-\mu)/\sigma \geq 1.81$) = 0.0351 and P($0 < Z \leq 1.28$)=0.40].

   (a) Find the standard deviation σ of the distribution of scores.
   (b) Find the percentage of students who obtained 90 or more.

3. (a) 10 items are chosen at a time at random from a lot consisting of 20 defective items and 80 non-defective items.

Obtain the probability of finding exactly 4 defective and 6 non-defective items in the sample drawn.

(b) The following table shows the distribution pattern of loading time (in seconds) of containers on the M.V Samudragarh.

Loading time of a container (sec.)	59-61	61-63	63-65	65-67	67-69	Total
No. of containers	4	30	45	15	6	100

Compute the coefficient of variations (in percentage) of loading time of containers. [Steps of computations to be shown.]

4. (a) There are two boxes, 1st containing 2 red and 1 white balls and 2nd containing 1 red and 2 white balls. One ball is chosen at random from the 1st box and placed in the 2nd box. Then one ball is chosen at random from the 2nd box. Find the probability that the last ball drawn from the 2nd box is red.

(b) M.V Oriental Venture receives a specific spare parts for its engine from two different Vendors A_1 and A_2. At present 65% of the said spare parts are purchased by the vessel from Vendor A_1 and the remaining from Vendor A_2. The conditional probability of getting good spare parts (G) and bad spare parts (B) from the two vendors are given below.

$P(G|A_1) = 0.98$; $P(B|A_1) = 0.02$; $P(G|A_2) = 0.95$; $P(B|A_2) = 0.05$

Find $P(A_1|B)$ given that $P(B|A_1) = 0.02$;

Also find $P(A_2|B)$ given that $P(B|A_2) = 0.05$

5.   Discuss concisely the following topics (any two):

(a) Common measurements of trends.
(b) Useful measurements of price and quantity indexes.
(c) Important random sampling methods.
(d) Applications of statistics in business and economy.

6. (a) A vaccine is claimed to prevent 90% children of getting liver infections in life time. 80 children are randomly chosen and administered the vaccine to test the claim. Out of them, 59 children have got subsequently infection with liver. State the appropriate hypotheses and test if the claim is justified at the 5% level of significance [Given $Z_{0.05}$ = 1.6449].

(b) Performance scores of 10 trainees before and after an intensive training for six months at their work place are recorded below. Test statistically whether there has been any significant change in performance scores as a result of the intensive training at 5% level of significance.

Performance scores before training (Y):	59	62	48	64	52	47	38	51	39	41
Performance scores after training (X) :	65	70	49	67	55	48	41	49	43	39

[Given $t_{9,0.05}$ = 1.833 ; $t_{9,0.025}$ = 2.262]

7.(a) Over the last decade the market shares have stabilised at 30% for Brand A, 50% for Brand B and 20% for Brand C in the smart phone market. Now 200 customers have been asked to choose a brand of smart phone from the list of 3 brands. The observations have been summarised below.

Brand	Number of customers
A	48
B	98
C	54
Total	200

Perform a goodness of fit to test if the preference for brands has remained unchanged at 5% level of significance [Given $X^2_{0.05, 2}$ = 5.991].

(b) The Sumudra Manthan Logistics Company is operating three modern ship-to-shore container Cranes A, B and C at the Port of Haldi. The management has collected 5 sample observations on crane productivity for each of the three cranes. They are presented in the following table.

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Crane Productivity		
Crane A	Crane B	Crane C
20	18	25
21	20	28
23	17	22
16	15	28
20	25	32

Construct an ANOVA table to test if the mean productivity of the three cranes are same or different. [$F_{2,12,0.05} = 3.89$]

8. HAPPY VALLEY PROJECTS purchased a parcel of land for building a new complex of luxury flats. Three alternative projects have been identified- - (d_1) one with 30 luxury flats, (d_2) one with 60 luxury flats, and (d_3) one with 90 luxury flats. The financial success of the project depends upon (1) the size of the complex, and (2) the chance event concerning the demand for the luxury flats.

The pay-off matrix for the project along with the chance events as viewed by the company is presented below. All pay-offs are in Rs million.

State of Nature

Decision Alternatives	Strong demand S_1	Weak demand S_2
Small complex d_1	8 Rs million	7 Rs million
Medium complex d_2	14 Rs million	5 Rs million
Large complex d_3	20 Rs million	- 9 Rs million
Probability (decision maker's view)	0.8	0.2

(a) Draw a decision tree based upon the information provided in the pay-off matrix. Decision and chance nodes have to be shown clearly in the tree.

(b) Compute the expected values for alternatives and recommend the best decision for choice of the size of the project.

(c) Using the maximin payoff approach, compute and recommend the best decision for choice of the size of the project.

(d) Using the maximum likelihood payoff approach, compute and recommend the best decision for choice of the size of the project.