INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
End Semester Examinations December 2018
M.Tech. (Marine Engineering and Management)
Semester-I
Statistics for Business Managers (PG13T1106)

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Date:02-01-2019   Maximum Marks: 100
Time: 3Hrs   Pass Marks: 50

Note: Answer **any five** questions. All questions carry equal marks.
                                                          (5 X 20 Marks = 100)

1.(a) Derive the Moment Generating function of Poisson distribution.
        Hence find the first three moments of Poisson distribution.   [8]

  (b)   An analysis of the monthly wages paid to workers in two farms
        A and B belonging to the same industry gives the following results:

	Firm A	Firm B
No. of workers	586	648
Average monthly salary	Rs. 52.5	Rs.47.5
Standard deviation of distribution Of wages	Rs. 10	Rs.11

    b.1 Which farm A and B pays more amount as monthly wages?
    b.2 Which farm A and B has greater variability in individual wages?
    b.3 Find the average monthly wage and standard deviation of the
         wages of all the workers in the two farms A and B.
                                                                        [7]

  (c)   Prove that
                    A.M $\geq$ G.M. $\geq$ H.M

    where A.M, G.M and H.M represent arithmetic mean Geometric Mean
    and Harmonic Means of a set of n observations.   [5]

2. (a) State and prove Bayes' Theorem.   [6]

   (b) There are three urns. Each Urn contains white, black and red balls
        as follows:

        Urn 1 : 1 white, 2 black and 3 red balls
        Urn 2 : 2 white, 1 black and 1 red balls
        Urn 3:   4 white, 5 black and 3 red balls

    An Urn is chosen at random and two balls are drawn from the Urn.
    They happen to be white and red balls. Find the probability that
    the balls came from Urn 2.   [7]

(c) To pass an examination an examinee requires at least 33 marks. To pass in the second division he requires at least 51 but less than 60 marks and to pass in first division he requires at least 60 marks in that examination.

The distribution of marks received by the examinees in that examination is Normal. 22% failed in that examination and 1515 out of 10,000 candidates passed in the first division, find the no. of candidates expected to pass in second division out of those 10,000 candidates.

[Given Φ (0.77) = 0.78 , Φ(1.03 = 0.8485 and Φ(0.43) = 0.6664 ;

where $\Phi(t) = \int_{-\infty}^{t} \frac{e^{\frac{-t^2}{2}}}{\sqrt{2\pi}}$]   [7]

3.(a) Two types of drugs were used on 10 and 12 patients for reducing their weights. Drug A was imported and Drug B was indigenous. he decrease in the weights after using the drugs for four months was as follows:

Drug A: 10, 6, 16, 17, 13, 12, 8, 14, 15, 9 lbs
Drug B: 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17 lbs

Is there a significant difference in the efficiency of the two drugs? You may use the fact that at 5% value of t for 20 degrees of freedom is 2.09.

[10]

(b)A random sample of 500 students were selected and classified according to their merit and according to economic condition of their families, as follows:

Merits	Economic Condition			Total
	Rich	Middle Class	Poor	
Meritorious	42	137	61	240
Not Meritorious	58	113	89	260
Total	100	250	150	500

Test whether the two attributes Merit and Economic conditions are associated or not. (Given χ^2 = 5.99 and χ^2 =9.21 for 2 d.f)
[10]

4.(a) Describe the Simple Random Sampling method with replacement and without replacement.

Define the terms:
  a.1   Parameters,
  a.2   statistic
  a.3   standard error.

[6]

(b) The values of a character x of a population containing six units are as follows:

3, 9, 6, 5, 7, 10.

Draw all possible samples of size (without replacement) from the above population and show that the sample mean is exactly equal to the population mean. Verify also the formula for the standard error of sample mean $\bar{x}$.

[7]

(c) A quality control supervisor for light bulb manufacturer is concerned with uniformity in the life of the light bulbs produced by two different processes A and B. The life of the light bulbs of process A has a normal distribution with mean and standard deviation. Similarly, for process B, they are. The data pertaining to the two process are given below:

Sample A	Sample B
n_1 = 16	n_2 = 21
$\bar{x_1}$ = 1200 hrs	$\bar{x_2}$ = 1300 hrs
6_1 = 60 hrs	6_2 = 50 hrs

Test at 5% significance level, whether the two processes have the same variability.

[Given $F_{(15,20), .05}$ =   2.20   ]

[7]

5. (a)Ten students obtained the following marks in Engineering and Statistics in the M.Tech examination. Calculate the Rank correlation coefficient.

Student (roll No.)	1	2	3	4	5	6	7	8	9	10
Marks in Engineering	78	36	98	25	75	82	90	62	65	39
Marks in Statistics	84	51	91	60	68	62	86	58	53	47

[10]

(b) The following represents the number of units of production per day produced by 5 different workers using 4 different types of machines:

Machine Type				
	A	B	C	D
Workers				
1	44	36	48	38
2	48	40	50	44
3	37	38	40	36
4	45	34	45	32
5	40	44	50	40

On the basis of this information can it be concluded that (i) workers do not differ with regard to mean productivity (ii) mean production is same for different machines? Given

$$[F_{0.05;2,12} = 3.49, \quad F_{0.05; 4,12} = 3.25]$$

[10]

6.(a) State the properties of Correlation Coefficient and prove any two important properties of Correlation coefficient

[10]

(b)b.1 Point out the role of regression analysis in business and industry. What are the properties of the regression coefficients?

b.2 A company manufactures different types of electric appliances. It has been using television for advertising its products. The following table shows the amount of television time (X in seconds) per day and the number of electrical appliances sold (Y) over the last several weeks:

X	10	12	13	16	17	20	25
Y	19	22	24	27	29	33	37

(a) Fit a regression of Y on X
(b) What will be the value of Y when X is 27? [10]

7. (a) The profits (in '000 Rs.) of a Shipping Company during the last eight years are given below . Fit a parabolic trend equation using least square method and estimate the expected profit for 2019 from the following data:

Year	2010	2011	2012	2013	2014	2015	2016	2017
Value	380	400	650	720	690	600	870	930

[10]

(b) b.1 Briefly describe the Exponential Smoothing method.

b.2 Using the method of single exponential, find the expected no. of containers used by the shipping line A in 2019. Take smoothing coefficient (a) = 0.1

Year	2012	2013	2014	2015	2016	2017	2018
No. of Containers used('00)	195	197	210	175	155	180	220

[10]

8.(a) Define the following terms (any three):

a.1   Expected monetary value (EMV)
a.2   Expected value of Perfect Information(EVPI)
a.3   Fisher's Ideal Index No.
a.4   Saddle point,
a.5   Value of the game

[6]

b) Mr. Majumdar has Rs. 1,00,00,000(One Crore) to invest in one of the three options: A,B or C. The yearly return on his investment depends on whether the economy experiences inflation, recession, or no change at all. His possible return under each economic condition are given below:

Options	Inflation	STATE OF NATURE Recession	No change
A	9,00,000	5,00,000	3,50.000
B	7,00,000	6,50,000	0
C	5,00,000	5,00,000	5,00,000

Which option should Mr. Majumdar choose on the basis of

b.1 Maxmin criterion

b.2 Maximax Criterion

b.3 Minimax regret criterion

b.4 Laplace criterion?

[6]

c) Two Shipping Lines A and B are competing for an increased market share. The payoff matrix, shown in the following table for different

types of strategies, shows the increase in market share for A and decrease in market share of B.

A	B			
	B₁ - Give coupons	**B₂** - Decrease Price	**B₃** Maintain present Strategy	**B₄** - Increase advertisement
A₁ - Give coupons	3	2	4	0
A₂ - Decrease Price	3	4	2	4
A₃ - Maintain present Strategy	4	2	4	0
A₄ - Increase advertisement	0	4	0	8

Simplify the problem by the rule of dominance and find the optimal strategies for both the Shipping Lines and the value of the game.

[8]

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