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Question Paper Code : 47042

M.B.A. DEGREE EXAMINATION, JANUARY 2018
First Semester
BA 5106 – STATISTICS FOR MANAGEMENT
(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Let X be the lifetime in years of a mechanical part. Assume that X has the cdf $F(x) = 1 - e^{-x}$, $x \geq 0$. Find $P[1 < X \leq 3]$.
2. Suppose that X has a Poisson distribution with parameter $\lambda = 2$. Compute $P[X \geq 1]$.
3. Distinguish between statistic and parameter.
4. From a population of 540, a sample of 60 individuals is taken. From this sample, the mean is found to be 6.2 and the standard deviation 1.368. Find the estimated standard error of the mean.
5. Define Type I Error and Type II Error in the tests of hypothesis.
6. When does the z – Test apply ?
7. State any two uses of Chi-square test.
8. Distinguish between the Mann-Whitney U test and the Kruskal-Wallis test.
9. Calculate the sample coefficient of determination if $n = 10$,
 $\sum y = 1922$, $\bar{y} = 192.2$, $\sum xy = 84541$, $\sum y^2 = 395024$ $a = -80.4430$ and $b = 6.4915$.
10. Explain the difference between the coefficient of determination and the coefficient of correlation.



11. a) Suppose that $\frac{3}{4}\%$ of a population have a terminal disease and that the test to detect this disease is 99% accurate in identifying those with the disease and 95% accurate in identifying those without the disease. Compute the probability that one has the disease given that the test so indicates.

(OR)

- b) i) The average number of defective chips manufactured daily at a plant is 5. Assume the number of defects is a Poisson random variable X . Compute mean and variance of X if $P[X = 0] = 0.0497$. (6)
- ii) Let random variable X be $N(1, 2)$ and independent Random Variable Y be $N(3, 4)$. Compute $P[X < 1.5, Y < 2]$; $P[Y - X < 0]$ and $P[2X + 3Y > 9]$. (7)

12. a) i) Find a 95% confidence interval for σ^2 and σ , given the following random sample of size 10 from a normal population :
22, 34, 23, 25, 30, 26, 27, 25, 27, 29 (6)
- ii) A speed-reading course guarantees a certain reading rate increase within 2 days. The teacher knows a few people will not be able to achieve this increase, so before stating the guaranteed percentage of people who achieve the reading rate increase, he wants to be 98 percent confident that the percentage has been estimated to within ± 5 percent of the true value. What is the most conservative sample size needed for this problem ? (7)

(OR)

- b) i) A simple random sample of size 100 has mean 15, the population variance being 25, find an interval estimate of the population mean with a confidence level of 99% and 95%. (6)
- ii) Dr. Benjamin Shockley, a noted social psychologist, surveyed 150 top executives and found that 42 percent of them were unable to add fractions correctly. Estimate the standard error of the proportion and construct a 99 percent confidence interval for the true proportion of top executives who cannot correctly add fractions. (7)

13. a) i) Given a sample mean of 83, a sample standard deviation of 12.5 and a sample size of 22, test the hypothesis that the value of the population mean is 70 against the alternative that it is more than 70. Use the 0.025 significance level. (5)
- ii) Two samples are drawn from two normal population. From the following data, test whether the two samples have the same variance at 5% level of significance.

Sample 1 : 60 65 71 74 76 82 85 87

Sample 2 : 61 66 67 85 78 63 85 86 88 91

(8)

(OR)

b) A manufacturing company has purchased three new machines of different makes and wishes to determine whether one of them is faster than the others in producing a certain output. Five hourly production figures are observed at random from each machine and the results are given below :

A ₁ :	25	30	36	38	31
A ₂ :	31	39	38	42	35
A ₃ :	24	30	28	25	28

Use analysis of variance and determine whether the machines are significantly different in their mean speed at 5% level of significance.

14. a) Verify whether Poisson distribution can be assumed from the data given below :

No. of defects :	0	1	2	3	4	5
Observed frequency :	6	13	13	8	4	3

(OR)

b) Melisa's Boutique has three mall locations. Melisa keeps a daily record for each location of the number of customers who actually make a purchase. A sample of those data follows. Using the Kruskal Wallis test, can you say at the 0.05 level of significance that her stores have the same number of customers who buy ?

X Mall :	99	64	101	85	79	88	97	95	90	100
Y Mall :	83	102	125	61	91	96	94	89	93	75
Z Mall :	89	98	56	105	87	90	87	101	76	89

15. a) Cost accounts often estimate overhead based on the level of production. At the standard knitting Co., they have collected information on overhead expenses and units produced at different plants and want to estimate a regression equation to predict future overhead.

Overhead :	191	170	272	155	280	173	234	116	153	178
Units :	40	42	53	35	56	39	48	30	37	40

- i) Develop the regression equation for the cost accountants.
- ii) Predict overhead when 50 units are produced.
- iii) Calculate the standard error of estimate.

(OR)

b) Ten competitors in a beauty contest are ranked by three judges in the following order.

I Judge :	1	6	5	10	3	2	4	9	7	8
II Judge :	3	5	8	4	7	10	2	1	6	9
III Judge :	6	4	9	8	1	2	3	10	5	7

Use the rank correlation coefficient to determine which pair of judges has the nearest approach to common tastes in beauty.



16. a) The following is the frequency distribution of 1000 students of a college :

Height (in inches)	Frequency
59.5 – 60.5	2
60.5	9
61.5	28
62.5	75
63.5	125
64.5	200
65.5	214
66.5	160
67.5	110
68.5	50
69.5	20
70.5	5
71.5 – 72.5	2

Test the normality of the distribution.

(OR)

b) In a feeding experiment on Swines, three rations R_1 , R_2 , R_3 were tried. The animals were put into three classes of three each according to litter and initial body weight. The following table gives the gains in body weight in kg in a certain period. Analyse the data and state your conclusion.

	Class I	Class II	Class III
R_1	4	16	10
R_2	14	18	19
R_3	3	14	7