PES University, Bengaluru (Established under Karnataka Act No. 16 of 2013)	**UE20CS902**

Model Question Paper

Executive Master of Business Administration

Statistical Methods for Decision Making

Time: 3 Hrs	Answer All Questions	Max Marks: 100

INSTRUCTIONS

- All questions are compulsory.
- Section A should be handwritten in the answer script provided
- Section B and C are coding questions which have to be answered in the system.

SECTION A – 30 MARKS

1	a)	Compute the mean, standard deviation for the following data set Weight in pounds = [51, 68, 83, 93, 89, 58, 79, 54, 60, 77, 87, 57, 63, 85, 92, 74, 67, 88, 91, 82]	5	E
	b)	Consider the following output file of sales data	5	M

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1 Sales.describe()
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	Item_Weight	Item_Visibility	Item_MRP	Outlet_Establishment_Year	Item_Outlet_Sales	Profit
count	7774.000000	8523.000000	8523.000000	8523.000000	8523.000000	8523.000000
mean	11.676740	0.066132	140.998838	1997.831867	2181.288914	13.414514
std	5.776851	0.051598	62.258099	8.371760	1706.499616	1.701840
min	0.000000	0.000000	31.300000	1985.000000	33.290000	0.100000
25%	7.720000	0.026989	93.800000	1987.000000	834.247400	13.150000
50%	11.800000	0.053931	142.700000	1999.000000	1794.331000	13.900000
75%	16.500000	0.094585	185.650000	2004.000000	3101.296400	14.300000
max	21.350000	0.328391	266.900000	2009.000000	13086.964800	24.000000

		Based on the data and using coefficient of variation, order the high to low in terms of coefficient of variation value (Do not consider outlet establishment year for calculation.		
	c)	State Central limit theorem and list the four characteristics of normal distribution	5	E

d)	List four different sampling techniques and explain any of them in detail	5	E
e)	A Maintenance firm has gathered the following information regarding the failure mechanism for air conditioning. Find the probability a) That failure involves a gas leak, b) That there is evidence of electrical failure given that there was gas leak |	Evidence of Gas Leaks	
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Evidence of Electrical Failure	Yes	No
Yes	55	17
No	32	3		5	M
f)	An engineer who is studying the tensile strength of a steel alloy intended for use in golf club shafts knows that the tensile strength is approximately normally distributed with σ = 60 psi. A random sample of 12 specimens has a mean tensile strength of $\bar{X} = 3250\,psi$. a) Test the hypothesis that mean strength is 3500 psi for an alpha =.01 What would be the two sided confidence interval on the mean tensile strength	5	H

Part B 30 marks

2	a)	The sick leave time of employees in a firm in a month is normally distributed with a mean of 100 hours and a standard deviation of 20 hrs. what is the probability that the sick leave time for next month will be between 50&80 hrs. How much time should be budgeted for sick leave if the budgeted amount should be exceeded with a probability of only 10%.	6	M
	b)	The weight in pounds of 20 high school students were collected to study if students are obese. On an average, weight of such students is 82 pounds. Check if the data is normally distributed. Find the sampling error and calculate 95% confidence interval for the population weight. Weight in pounds = [51, 68, 83, 93, 89, 58, 79, 54, 60, 77, 87, 57, 63, 85, 92, 74, 67, 88, 91, 82]	6	E
	c)	The amount of water consumed each day by a healthy adult follows a normal distribution with a mean of 1.52 liters. A sample of 10 adults water consumption in liters is taken and it has a mean of 1.76 liters and S.D of 0.18.Test whether any increase in the consumption of water? (i) State the null hypothesis and the alternate hypothesis. (1 mark) (ii) Which test is to be performed. (1 mark) (iii) Compute the value of the test statistic. (2 marks) (iv) At the 0.05 significance level, can we conclude that water consumption has increased? (2 mark)	6	E

d)	Two persons have done a particular assembly process and the time taken is recorded in terms of minutes. The manager wants to prove that person 1 has assembled at a faster pace (faster pace implies less time), than person 2. Based on data do you support the manager's claim for a significance level of .01				6	M

Person 1 data

45	46	45	47	49	50	53	44	49	44	45	46	40	52	53
44	48	53	53	51	46	47	49	52	48	47	46	46	45	49

Person 2 data

43	46	44	46	47	50	48	47	49	43	46	47	44	43	48
45	44	47	47	46	46	47	48	48	51	50	49	45	45	46

e)	The demand for a particular spare part was found to vary from day to day. In a sample study the following information was obtained.	6	M

Quantity demanded

Days	Mon	Tue	Wed	Thur	Friday	Saturday
Quantity demanded	1124	1125	1110	1120	1126	1115

i. Write the hypothesis.(2 marks)

ii. Test the hypothesis at 1% level of significance that the number demanded depends upon the day (4 marks)

SECTION C – 40 MARKS

4	a	Consider the sales data in file k_circle_sales.csv,	20	E

i) Provide a summary statistic of the data for both categorical and nominal variables, mention which variable has highest and lowest variability   5 marks

ii) Plot a histogram and box plot of both sales and profit, based on the plots what would you say about skewness and kurtosis 5 marks

iii) Provide a correlation matrix and scatter plot of all the numerical variables, based on both, which variables is highly correlated and which are not   5 marks

iv) Provide a histogram based for sales based on two groups of item fat content (Low fat and Regular), what do you observe, would you prefer conducting an hypothesis test for this. 5 marks

b	Consider the sales data in file k_circle_sales.csv,	20	M
	i) check whether the profit data follows normality - 3 marks		
	ii) Conduct a hypothesis test to check whether sales from low fat item is more than regular fat item, state the hypothesis, mention the test, conduct the analysis and conclude 4 marks		
	iii) Conduct an anova to determine whether the sales for item type such fruits&vegetables, snack foods, household and diary are different or same. – 5 marks		
	iv) Conduct an hypothesis to see whether the proportion of sales from fruits and vegetables is more than that of snack foods – 4 marks		
	v) Conduct an hypothesis test check whether sales from medium size outlet is more than small outlet 4 marks		