

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Quantitative Methods

Programme: MBA(LSCM)

Time: 03 hrs.

Course Code: DSQT 7001

Semester: I

Max. Marks: 100

Instructions: Simple Calculator is allowed not the scientific (991-function) one. Statistical Tables and graph sheets will be provided by SRE. Try to maintain the sequence while answering.

SECTION A

S. No.		Marks	CO
Q 1	Answer the following MCQs with relevant explanation:	(15*2=30)	
	<p>I. Statement 1: The prices of petrol and diesel in the domestic Market have remained unchanged for the past few months.</p> <p>Statement 2: The crude oil prices in the international market have gone up substantially in the last few months.</p> <p>a) Statement 1 is the cause and statement II is its effect b) Statement 2 is the cause and statement I is its effect c) Both the statements 1 and 2 are independent causes d) Both the statements 1 and 2 are effects of independent causes</p> <p>II. A normal distribution has mean 40 and standard deviation 5 , 68% area lies between the below mentioned range.</p> <p>a) 30-50 b) 0-45 c) 0-68 d) 35-45</p> <p>III. A set of test score is normally distributed with mean 100 and standard deviation 20. These scores are converted to standard normal Z-scores. What would be the mean and median of this distribution?</p> <p>a) 0 b) 50 c) 1 d) 5</p> <p>IV. Many studies show that advertising expenditure and sales have a high degree of positive association. Which of the following correlation coefficient is consistent with the above statement?</p> <p>a) -0.8</p>		<p>CO1</p> <p>CO4</p> <p>CO5</p> <p>CO1</p>

	<p>b) 0.4 c) -0.3 d) 0.75</p> <p>V. If the expected profit of a business firm for January 2016 is Rs. 10 lakh, then the profit for February will be</p> <p>a) Rs. 10 lakh b) Less than Rs. 10 lakh c) More than Rs. 10 Lakh d) None of the above</p> <p>VI. In the context of a binomial distribution, if on an average 8 ships out of 10 arrive safely at ports and 150 ships have returned safely, the mean is</p> <p>a) 80 b) 100 c) 120 d) 150</p> <p>VII. In which situation of the following situations , the Poisson distribution can be a good approximation of the binomial distribution?</p> <p>a) $n=300$ and $p=0.04$ b) $n=60$ and $p=0.52$ c) $n=60$ and $p=0.35$ d) <i>all of these</i></p> <p>VIII. which of the following normal curves look very similar to the curve for $\mu = 12$ and $\sigma = 4$?</p> <p>a) curve for $\mu = 24$ and $\sigma = 8$ b) curve for $\mu = 12$ and $\sigma = 8$ c) curve for $\mu = 20$ and $\sigma = 9$ d) curve for $\mu = 24$ and $\sigma = 4$</p> <p>IX. Which of the following is true if the estimating equation has to be a perfect estimator of the dependent variable?</p> <p>a) The coefficient of determination is -1 b) All the data points are on the regression line c) The standard error of the estimate is zero d) 'b' and 'c' both</p> <p>X. The model for the number of cars on road without pollution check 'y' for a given pollution index 'x' is $y=9.607x + 111.958$. what is the meaning of the slope?</p> <p>a) This value tells that for every increase by 1in (pollution index) input variable 'x', we get an increase approximately 9 cars without pollution check on road b) This value tells that for every increase by 9in (pollution index) input variable 'x', we get an increase approximately 1 car without pollution check on road</p>		<p>CO3</p> <p>CO3</p> <p>CO4</p> <p>CO5</p> <p>CO5</p>
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	<p>c) This value tells that for every increase by 1 in (pollution index) input variable 'x', we get an increase approximately 112 cars without pollution check on road</p> <p>d) This value tells that for every increase by 112 in (pollution index) input variable 'x', we get an increase approximately 9 cars without pollution check on road</p> <p>XI. Coefficient of determination r^2 can be written is</p> <p>a) SST/SSR</p> <p>b) 1-(SSE/SST)</p> <p>c) SSR/SST</p> <p>d) 'b' and 'c' both</p> <p>XII. Assuming a normal curve with curve for $\mu = 40$ and $\sigma = 8$, how much area the curve will have to the right of the value 40?</p> <p>a) 0.25</p> <p>b) 1.0</p> <p>c) 0.75</p> <p>d) 0.5</p> <p>XIII. Which of the following is most likely to be an inverse relationship?</p> <p>a) Between income and expenditure on education</p> <p>b) Between price increase and demand for a certain product</p> <p>c) Between average number of hours studied per day and performance of the students in the examination</p> <p>d) Between advertising expenditure and sales of a product</p> <p>XIV. Regression Coefficient = -4.94. Correlation coefficient=0.77 and Coefficient of determination = 0.65 are the output of a particular data. Do you think the results are correct?</p> <p>a) Yes</p> <p>b) No</p> <p>c) Can't say</p> <p>XV. Elasticity of demand measures the responsiveness of</p> <p>a) Quantity demanded as price changes</p> <p>b) Price as quantity demand changes</p> <p>c) Price as demand shifts</p> <p>d) Demand as supply shifts</p> <p>XVI. The flat distribution has more area underneath than the peaked distribution.</p> <p>a) True</p> <p>b) False</p>			<p>CO5</p> <p>CO3</p> <p>CO1</p> <p>CO5</p> <p>CO1</p> <p>CO3</p>
SECTION B				
	Attempt all 4 questions in this section:	(4*5=20)		
Q2	According to a survey, the probability that a family owns two cars if its monthly income is greater than Rs. 45,000 is 0.7 of the household surveyed, 50% had incomes over Rs.	5	CO3	

	45,000 and 40% had two cars. What is the probability that a family has two cars and an income over Rs. 45,000.		
Q3	A portfolio consultant firm has three advisers, Mr. Khare, Mr. Batra and Mr. Singh, to advise its clients regarding investments in secondary market. In a particular week, the numbers of clients who take the advice of Mr. Khare, Mr. Batra and Mr. Singh and invest are 200, 180 and 120 respectively. 'Mr. Khare', being higher experienced, has the reputation that 90% of his clients are benefitted. The corresponding figures for 'Mr. Batra' and 'Mr. Singh' are 80% and 75% respectively. At the end of the week, a client was selected at random, and it was found that he had not benefitted from the advice. Find the probability that he was advised by 'Mr. Batra'.	5	CO2
Q4	A flat in Metropolitan city cost somebody Rs. 60,00,000. If it appreciates in value, 15% the first year, 13.5% the next year, 12% the third year, and so on as more the time goes flat needs more maintenance, what will be its value at the end of 10 years, all percentages applying to the original cost?	5	CO1& CO2
Q5	A production manager finds that on an average, mechanics working in a machine complete a certain task in 15 minutes. The time required to complete the task is approximately normally distributed with a standard deviation of 3 minutes. Find the probabilities that the task would be completed a) less than 8 minutes, b) in more than 9 minutes, and c) between 10 and 12 minutes.	5	CO5
SECTION-C			
	Attempt all questions in this section:	(2*15=30)	
Q6	M/s Standard Engineering Company manufactures various equipment required for pipeline industry. Since it undertakes turnkey projects, the manufactured items are not standardized. The Director of the company is working on a tender for an export order, and are looking at various cost factors. The component requires 4500 hours of machining. Mr. Joshi, Manager of the production unit, has been asked to submit a report on the production costs. He has estimated relevant direct costs but is facing problems while estimating indirect costs. He seeks your help based on the following data, which relate to X, machine hours ('00) and Y, indirect cost (Rs. 000'). Assess whether there exists a linear relation in X and Y, and, if yes, to what extent? Also estimate the required indirect cost when X is 5000, machine hours.	15	CO5

X(hours '00)	40	24	8	40	32	24	16	48	32	16
Y (Rs. '000)	96	88	48	110	80	64	56	120	88	54

Q7 A firm that sells office supplies wants to expand. The head of the firm wants to know what sales volume can be expected in various market areas. Regression analysis with sales as the dependent variables is suggested. It is decided that effective buying income would be the best independent variable. A sample of 15 trade areas in which the firm now does business gives the following results in lakh of rupees.

Sum of $X=1385$

Sum of $Y=83.6$

Sum of $X \times Y=0917.60$

Sum of $X \text{ square}=179661$

Sum of $Y \text{ square}=681.32$

- Develop the equation that best describes the relationship between effective buying income and sales
- For a trade area with an effective buying income of Rs. 115, what is the estimated amount of sales?
- What is the coefficient of correlation for these data? Is it an appropriate measure that enables the manager to determine the proportion of variability in sales explained by the effective buying income? Explain.

15

CO2

SECTION-D

Q8 **CASE STUDY - STATE ELECTRICITY BOARD**

20

CO2

A state Electricity Board is planning for construction of new facilities in the state for the next 10 years. It is possible to construct four types of electric power facilities, viz., steam plants using coal for energy, hydroelectric plants with no reservoir, hydroelectric plants with small reservoirs (enough water storage capacity to meet daily fluctuations), and hydroelectric plants with large reservoirs with enough water storage to meet seasonal fluctuations in power demand and water flow. Consumption of electricity is based on three characteristics. The first is the total annual usage, i.e. the requirement in the area is estimated to be 4,000 lakh kilowatt-hours by the 10th year. The second characteristic is the peak usage of power, usually during summer. Any plan should provide enough peaking capacity to meet a projected peak need of 3,000 lakh kilowatts in the 10th year. The third characteristic is guaranteed power output measured as the average daylight output in mid-winter when the consumption is high and water levels for hydroelectric power are low. The 10-year requirement is for 2,000 lakh kilowatts of guaranteed power. The various possible power plants vary in terms of how they can satisfy these characteristics, that is, hydroelectric plants with reservoirs are able to provide substantial peak capacity, and whereas steam plants are hydroelectric plants with no reservoirs are poor in this respect. The characteristics of the various types of plants are shown in the table below. Each is measured in terms of a unit of capacity. The unit of capacity is defined to be the capacity to produce 1 million kilowatt hours per year.

Characteristics of Electric Plants per Unit

Sl. No.	Type	Guaranteed output (lakh of kilowatts)	Peak output (lakh of kilowatts)	Investment cost (Rs. Crore)	Discounted total cost (rs. Crore)
1.	Steam	0.15	0.20	30	65
2.	Hydroelectric with no reservoir	0.10	0.10	40	42
3.	Hydroelectric with small reservoirs	0.10	0.40	60	64
4.	Hydroelectric with large reservoir	0.80	0.90	100	110

The types of plants vary substantially in their investment costs. The annual operating costs of the various types of plants also vary considerably, that is, the cost of coal makes the annual costs of the steam plants quite high whereas the annual costs of operating the hydroelectric plants are relatively less. The last column in the above table shows the discounted total costs including both the investment cost and the discounted annual operating costs.

	<p>The Board is seeking the advice of experts to understand how much capacity of each type of plant to build so as to minimize total discounted cost. However, there is a restriction that no more than Rs. 1,400 crore can be used for investment in plants over the 10 years.</p> <p>Questions for discussion</p> <ol style="list-style-type: none">1. Identify decision variables. Describe the objective function and constraints on the use of various resources verbally.2. Formulate the problem as an LPP model.		