

Roll No:-----



**UNIVERSITY OF PETROLEUM & ENERGY STUDIES
DEHRADUN**

End Term Examination – December, 2017

Program/course:MBA(UISC)/PM

Subject: Quantitative Methods

Code : DSQT7001

No. of page/s:08

Semester – I

Max. Marks : 100

Duration : 3 Hrs

Section-A

1. Mark the following statements as True or False

(1x7)

- i. Under Scatter diagram method the observed data are plotted on a graph paper taking one variable on X-axis and other on Y-axis. The scatterness of the dots so plotted gives the indication whether the correlation is positive or negative and also an idea about the degree of such relationship.
- ii. Rank correlation is used Where items cannot be measured in quantitative terms, but they can be arrayed or ranked, according to some variable attribute, such as beauty, intelligence and honesty.
- iii. In all the functional areas of business, like accounting, finance, management, and marketing, knowledge of statistics is a key for decision making.
- iv. The use of various statistical software like MS Excel, Minitab, SPSS, and SAS has reduced the burden of computing.
- v. The ordinal scale can be used to rank or order objects.
- vi. A population is a collection of a few elements, under statistical investigation.
- vii. A descriptive measure computed from a sample is called a statistic.

2. Select the most appropriate

(1x8)

- (i) Which of the following descriptive statistics is least affected by adding an outlier to a data set?
 - a. the mean
 - b. the median
 - c. the range
 - d. the standard deviation
 - e. all of the above
- (ii) The difference between the largest and the smallest data values is the

- a. variance
- b. interquartile range
- c. range
- d. coefficient of variation
- e. None of the above answers is correct.

(iii) If a data set has an even number of observations, the median

- a. can not be determined
- b. is the average value of the two middle items
- c. must be equal to the mean
- d. is the average value of the two middle items when all items are arranged in ascending order
- e. None of the above answers is correct.

(iv) In a sample of 800 students in a university, 160, or 20%, are Business majors. Based on the above information, the school's paper reported that "20% of all the students at the university are Business majors." This report is an example of

- a. a sample
- b. a population
- c. statistical inference
- d. descriptive statistics
- e. None of the above answers is correct.

(v) A tabular summary of a set of data showing the fraction of the total number of items in several classes is a

- a. frequency distribution
- b. relative frequency distribution
- c. frequency
- d. cumulative frequency distribution
- e. None of the above answers is correct.

(vi) A statistics professor asked students in a class their ages. On the basis of this information, the professor states that the average age of all the students in the university is 21 years. This is an example of

- a. a census
- b. descriptive statistics
- c. an experiment
- d. statistical inference
- e. None of the above answers is correct.

(vii) The variance of a sample of 81 observations equals 64. The standard deviation of the sample equals

- a. 0
- b. 4096
- c. 8
- d. 6,561
- e. None of the above answers is correct.

(viii) In function $y = f(x)$, 'f' is classified as

- a. name of function
- b. value of function
- c. upper limit of function
- d. lower limit of function
- e. None of the above answers is correct.

3. Decide whether these variables are qualitative or quantitative, and if they are quantitative, whether they are discrete or continuous (1x5)

- 1. Number of babies born in a day.
- 2. Blood group of a person.
- 3. Time needed to solve a problem.
- 4. Number of questions in an exam.
- 5. Temperature of a person.

Section-B

Attempt any Eight questions. (5x8)

4. The average and variance of 20 items were calculated by a student as 40 and 36 respectively. But at the time of checking it is found that an item which is 25 is wrongly copied as 30. Find the corrected mean and standard deviation.

5. Functions f and g are defined by

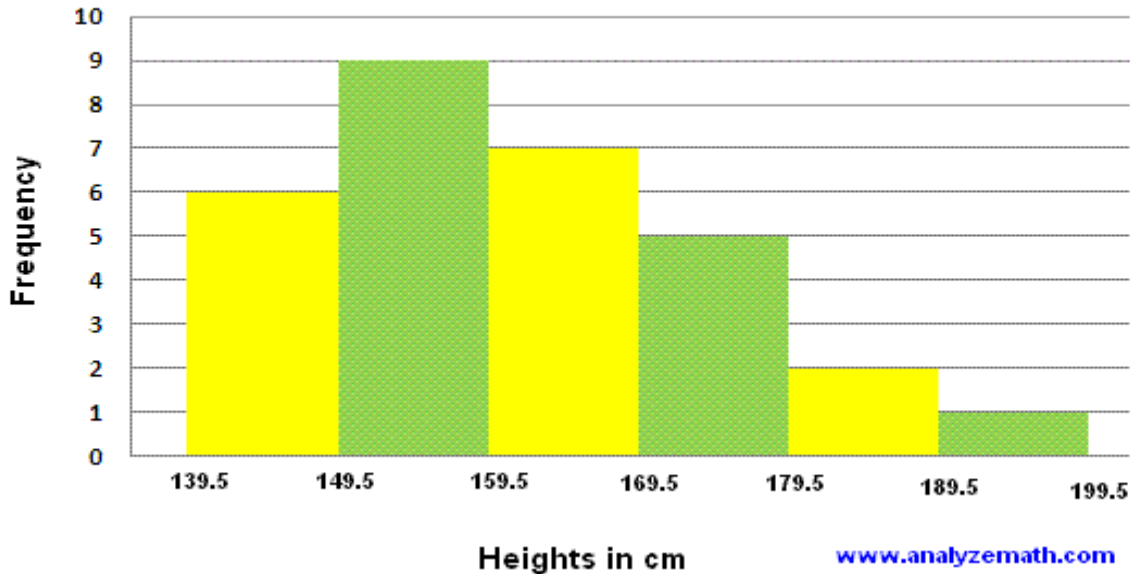
$$f(x) = 1/x + 3x \quad \text{and}$$

$$g(x) = -1/x + 6x - 4$$

Find $(f + g)(x)$ and $(f / g)(x)$. Also find $(f / g)(2)$ and $(f + g)(1)$

6. The histogram below shows the heights (in cm) distribution of 30 people. (1x5)

Heights of 30 people



- How many people have heights between 159.5 and 169.5 cm?
- How many people have heights less than 159.5 cm?
- How many people have heights more than 169.5 cm?
- What percentage of people have heights between 149.5 and 179.5 cm?
- What percentage of people have heights between 159.5 and 179.5 cm?

7. At the beginning of the 2015-16 academic year the number of years the full-time teaching faculty had been at Southwestern were:

13, 5, 20, 1, 8, 0, 3, 9, 31, 8, 2, 16, 1, 3, 19, 9, 0, 6, 8, 0, 3, 10, 18, 24, 5, 11, 15, 4, 4, 4, 36, 5, 4, 5, 3, 0, 3, 9, 17, 0, 13, 4, 15, 8, 5, 20, 19, 24, 6, 6, 9, 0, 37

- What is the mean? (2)
- What is the median? (1)
- Which is a better measure of the center of the data set? Why? (2)

8. Assume that the chance of a traffic accident in a day in a street of Dehradun is 0.001. If there are 1200 such streets in the whole city, how many days out of a total of 500 days can we expect in the city,

- No accident (2.5)
- More than 4 accidents per day (2.5)

9. A company has two sections with 40 and 65 employees respectively. Their average weekly wages are \$450 and \$350. The standard deviation are 7 and 9.

- Which section has a larger wage bill? (2)
- Which section has larger variability in wages? (3)

10. (i) The 4th and 8th terms of an A.P. is 24 and the sum of the 6th and 10th terms is 34. Find the 1st term and the common difference of the A.P. (2.5)

(ii) Given the terms $a_{10} = 3/512$ and $a_{15} = 3/16384$ of a geometric sequence, find the exact value of the term a_{30} of the sequence. (2.5)

11. What do you mean by descriptive statistics. What are the components of descriptive statistics. How it is different from inferential statistics?

12. What is the difference between mean deviation and standard deviation. Why we will compute coefficient of variation?

Section-C

Attempt any Four questions.

(10x4)

13. A study was made by a retail merchant to determine the relation between weekly advertising expenditure and sales. The following data were recorded:

Advertising cost	40	20	25	20	30	50	40	20	50	40	25	50
Sales	385	400	395	365	475	440	490	420	560	525	480	510

(i) Plot a scatter diagram. (5)

(ii) Find the regression line to predict weekly sales from advertising expenditures. (5)

14. Construct a discrete frequency distribution table. Also construct continuous frequency distribution table with suitable class interval size of marks obtained by 50 students of a class are given below: (4+6)

23, 50, 38, 42, 63, 75, 12, 33, 26, 39, 35, 47, 43, 52, 56, 59, 64, 77, 15, 21, 51, 54, 72, 68, 36, 65, 52, 60, 27, 34, 47, 48, 55, 58, 59, 62, 51, 48, 50, 41, 57, 65, 54, 43, 56, 44, 30, 46, 67, 53

15. Answer the followings based on output of multiple linear regression.

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.9955257							
R Square	0.99107143							
Adjusted R Square	0.98511905							
Standard Error	0.26352314							
Observations	6							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	2	23.125	11.5625	166.5	0.000843671			
Residual	3	0.208333333	0.069444					
Total	5	23.33333333						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	36.6666667	3.802107116	9.643775	0.002367	24.56666492	48.766668	24.56666492	48.76666841
x	9.875	0.972718127	10.15196	0.002036	6.779376789	12.970623	6.779376789	12.97062321
y	-18.125	1.920738429	-9.43647	0.002522	-24.23764692	-12.012353	-24.2376469	-12.01235308
<i>RESIDUAL OUTPUT</i>								
	<i>Observation</i>	<i>Predicted z</i>	<i>Residuals</i>					
	1	3.04166667	-0.04166667					
	2	2.04166667	-0.04166667					
	3	1.04166667	-0.04166667					
	4	3.66666667	0.333333333					
	5	5.29166667	-0.29166667					
	6	6.91666667	0.083333333					

- (i) What is the role of ANOVA in regression model. (2)
- (ii) Writedown the regression model. (5)
- (iii)What is the role of p value in regression model. (2)
- (iv) How residuals are calculated? (1)

16. The four variables shown in the data set below are set up to represent a fictitious study of gender, weight and fitness score. The variables include gender, ranking, weight and score. In this

example, gender is coded as m or f (recoded as 1 or 2 for computations), weight is the participant's weight, score is a value that the participant scored in a fitness test and rank is their ranking based on that score.

Gender	Ranking	Weight	Score
m	1	200	95
m	2	110	92
f	3	103	91
f	4	145	90
f	5	130	88
m	6	180	82
m	7	170	80
f	8	90	75
f	9	102	70
m	10	225	60
m	11	225	59
m	12	108	55
f	13	108	55
m	14	108	55
m	15	167	50

EACH OF THE VARIABLES IS EXAMINED IN THE CHART BELOW:

Statistics

			GENDER	RANKING	SCORE	WEIGHT
N	Valid	Statistic	15	15	15	15
	Missing	Statistic	0	0	0	0
Mean	Statistic		1.40	8.0000	73.1333	144.7333
	Std. Error		.13	1.1547	4.1928	12.0224
Median	Statistic		1.00	8.0000	75.0000	130.0000
Mode	Statistic		1	1.00 ^a	55.00	108.00
Std. Deviation	Statistic		.51	4.4721	16.2387	46.5625
Variance	Statistic		.26	20.0000	263.6952	2168.0667
Skewness	Statistic		.455	.000	-.085	.625
	Std. Error		.580	.580	.580	.580
Kurtosis	Statistic		-2.094	-1.200	-1.753	-1.037
	Std. Error		1.121	1.121	1.121	1.121
Range	Statistic		1	14.00	45.00	135.00
Minimum	Statistic		1	1.00	50.00	90.00
Maximum	Statistic		2	15.00	95.00	225.00

a. Multiple modes exist. The smallest value is shown

Answer the following questions:

- (i) What type of data does gender represent? (1)
- (ii) What type of data does SCORE represent? (1)
- (iii) Is this data set skewed in each case? If so, in which direction? (4)
- (iv) What does the kurtosis figure tell you in each case? (4)

17. The following information is collected from 200 students of UPES. It is pertaining to the student possessing a bank credit card and or a travel & entertainment credit card.

Bank credit card	Travel & entertainment credit card	
	Yes	No
Yes	80	40
No	50	30

If a student is selected at random, what is the probability that,

- (i) The student has a bank credit card. (2)
- (ii) The student has bank credit card & a travel & entertainment credit card. (2)
- (iii) The student has a bank credit card or has a travel & entertainment credit card. (2)
- (iv) The student has neither a bank credit card nor a travel & entertainment credit card. (2)
- (v) The student has a travel & entertainment credit card. (2)

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Section-A

1. Mark the following statements as True or False (1x5)

- i. The mean and standard deviation of a poisson distribution are always equal
- ii. The curve of binomial distribution is symmetrical.
- iii. Two events are said to be mutually exclusive if the happening of one does not affect the probability of happening of the other.
- iv. Standard deviation is divorced of the units of the original data.
- v. Mean is used in case of homogeneous data.

2. Select the most appropriate answer. (1x5)

i. Which of the relations below is a function?

- a. $\{(2,3), (3,4), (5,1), (6,2), (2,4)\}$
- b. $\{(2,3), (3,4), (5,1), (6,2), (7,3)\}$
- c. $\{(2,3), (3,4), (5,1), (6,2), (3,3)\}$
- d. All

ii. Given $f(x) = 2x^2 - 3x + 6$, find $f(3.5)$

- a.11 b. 23.5 c.76 d. None

iii. Given $f(x) = 2x + 3$ and $g(x) = -x^2 + 5$, find $(g \circ f)(-1)$.

- a. 20 b.-10 c.-2 d. 10 e. None

vi. Find the 10th term of the arithmetic progression 1, 3.5, 6, 8.5,...

- a.23.5 b.22.5 c.23 d.22

v. Any function is said to be increasing function if

- a. Average rate of change is positive
- b. Average rate of change is negative
- c. Average rate of change is unchanged
- d. None

3. Which measure of central tendency will be suitable to compare

(1x5)

- a) Heights of the students in two classes
- b) Intelligence of students
- c) Sale of cloth with size 38", 39" and 40"
- d) Average sales for various years
- e) Per capita income in several states

4. Fill up the blanks

(1x5)

- a. The geometric mean of 2, 4, 16 and 32 is _____.
- b. The relationship between A.M., G.M. and H.M. is _____.
- c. _____ is not affected by extreme observations.
- d. A distribution with two modes is called _____ and with more than two modes is called _____.
- e. Median = _____ quartile.

Section-B

Attempt any five questions

(6x5)

- 5. The average and standard deviation of 20 items were calculated by a student as 10 and 2 respectively. But at the time of checking it is found that an item which is 19 is wrongly copied as 8. Find correct mean and S.D.
- 6. What do you mean by parameter in statistics. How parameter is different from statistic? Explain with an example.
- 7. What is the difference between skewness and kurtosis. Why we will compute skewness?
- 8. Assume that the chance of a traffic accident in a day in a street of Dehradun is 0.002. If there are 2000 such streets in the whole city, how many days out of a total of 1000 days can we expect in the city,
 - (i) No accident (3)
 - (ii) More than 4 accidents per day (3)
- 9. Find correlation coefficient between the marks obtained by 10 students in the mid-term (X) & end-term (Y) examination in Quantitative Methods?

X	23	20	19	17	16	28	24	25	27	22
Y	30	28	27	41	36	45	46	44	43	39

10. If the two regression lines are $5X - Y = 22$ and $1.42X - Y + 2.82 = 0$. Identify which one is Y on X. Find the mean value of X and Y & the coefficient of correlation between X and Y. Find also the most likely value of Y when X=100 rupees.

Section-C

Attempt any five questions.

(10x5)

11. The local authorities in Dehradun install 10,000 electric lamps in the streets of the city. If these lamps have an average life of 1,000 burnings hrs with a variance of 40000 hrs, assume normality what number of lamps might be expected to fail, (i) in the first 800 burnings hrs and (ii) between 800 and 1200 burning hrs. (5+5)

12. The following are the “down time” of two computers A and B during the last ten days (data relate to number of hours of down time)

A	5	7	7	8	9	14	8	10	9	15
B	6	14	12	10	15	17	10	13	12	14

(i) Find the A.M., S.D. and C.V. of down times of the two computers. (7)

(ii) Compare the mean down time of the two computers and on the basis of C.V. comment on the variability. (3)

13. The following are the time taken by the police department on receipt of the complaint to find the culprit.

5,20,23,45,123,8,2,15,74,19,110,26,5,12,20,23,68,29,25,1,14,110,79,85,92,95,62,40,45,23,29,35,7,14,24,19,33,34,36,40,82,72,83,107,114,93,84,65,77,92,80,24,62,72,49,62,58,60,74

Construct discrete and continuous frequency distribution (both inclusive and exclusive) table.

14. Answer the followings based on output of linear regression.

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.896139363							
R Square	0.803065757							
Adjusted R Square	0.783372333							
Standard Error	7.017598563							
Observations	12							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	2008.199771	2008.19977	40.77837	7.976E-05			
Residual	10	492.466896	49.2466896					
Total	11	2500.666667						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	80.77773001	9.543745924	8.46394389	7.16E-06	59.512939	102.0425	59.5129389	102.042521
X	1.138005159	0.178208861	6.38579446	7.98E-05	0.7409311	1.535079	0.74093107	1.53507925
RESIDUAL OUTPUT								
<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>						
1	144.5060189	2.493981083						
2	128.5739467	-3.57394669						
3	162.7141015	-2.714101462						
4	121.7459157	-3.745915735						
5	152.472055	-3.47205503						
6	134.2639725	-6.263972485						
7	143.3680138	6.631986242						
8	136.5399828	8.460017197						
9	124.0219261	-9.021926053						
10	128.5739467	11.42605331						
11	158.1620808	-6.162080825						
12	149.0580396	5.941960447						

- (i) What is the role of ANOVA in regression model. (2)
- (ii) Write down the regression model. (5)
- (iii) What is the role of p value in regression model. (2)
- (iv) How residuals are calculated? (1)

15. Obtain the rank correlation coefficient for the following data :

X	85	74	85	50	65	78	74	60	74	90
Y	78	91	78	58	60	72	80	55	68	70

16. During the year 2012, oil consumption was 20 million barrels per day. The following data represent the percentage breakdown of the sources of that consumption.

Source of consumption	% Usage
Electric utilities	15
Highway transportation	50
House, industry & business	20
Misc.	15

Total	100

- i) Construct a bar chart (3)
- ii) Construct a pie chart (4)
- iii) Which of these charts is preferable and why? (3)