

Roll No.

Total No. of Questions : 17

Total No. of Pages : 04

MBA (2018 Batch) (Sem.-1)
QUANTITATIVE TECHNIQUES
Subject Code : MBA-103-18
M.Code : 75404

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A contains EIGHT questions carrying TWO marks each and students has to attempt ALL questions.
2. SECTION-B consists of FOUR Subsections : Units-I, II, III & IV. Each Subsection contains TWO questions each carrying EIGHT marks each and student has to attempt any ONE question from each Subsection.
3. SECTION-C is COMPULSORY carrying TWELVE marks.

SECTION-A

1. Define Statistics.
2. Define Mean.
3. Define Pearson's Correlation Coefficient.
4. What is probability?
5. What is Binomial Distribution?
6. Define Game Theory.
7. Define PERT.
8. What is Linear Programming?

SECTION-B

UNIT-I

9. From the following data find the value of median :

Income (Rs.)	5,000	5,500	6,800	8,000	8,500	7,800
No. of persons	24	26	16	20	6	30



10. From the prices of shares of X and Y below, find out which is more stable in value :

X	35	54	52	53	56	58	52	50	51	49
Y	108	107	105	105	106	107	104	103	104	101

UNIT-II

11. Calculate Karl Pearson's coefficient of correlation from the following data and interpret its value :

Roll No.	1	2	3	4	5
Marks in Science	48	36	18	23	47
Marks in Mathematics	43	20	40	25	45

12. Discuss various approaches to calculate probability.

UNIT-III

13. Explain Normal Distribution and its applications.

14. Use Simplex Method to solve the following L.P.P.:

Max. $Z = 5x_1 + 8x_2$ Subject to the constraints:

$$2x_1 + x_2 \leq 48, \quad 2x_1 + 5x_2 \leq 100, \quad 2x_1 + 3x_2 \leq 80; \quad x_1 \geq 0 \text{ and } x_2 \geq 0$$

UNIT-IV

15. Find the basic feasible solution by at least three different methods for the following transportation problem :

From / To	A	B	C	D	Availability
F ₁	10	7	3	6	3
F ₂	1	6	7	3	5
F ₃	7	4	5	6	7
Demand	3	2	6	4	

16. Four jobs 1, 2, 3 and 4 are to be processed on each of the five machines A, B, C, D and E in the ABCDE order. Find the total elapsed time if no passing jobs is permitted.

		Machines				
Jobs		A	B	C	D	E
	1	7	5	2	3	9
	2	6	6	4	5	10
	3	5	4	5	6	8
	4	8	3	3	2	6

SECTION-C

17. Solve the case study attached :

The equivalent of a new kindergarten class is born every day at Orlando's Arnold Palmer Hospital. With more than 13,000 births in the mid-2000s in a hospital that was designed 15 years earlier for a capacity of 6,500 births a year, the newborn intensive care unit was stretched to the limit. Moreover, with continuing strong population growth in central Florida, the hospital was often full. It was clear that new facilities were needed. After much analysis, forecasting and discussion, the management team decided to build a new 273-bed building across the street from the existing hospital. But the facility had to be built in accordance with the hospital's Guiding Principles and its uniqueness as a health center dedicated to the specialized needs of women and infants. Those Guiding Principles are: Family-centered focus, a healing environment, where privacy and dignity are respected, sanctuary of caring that includes warm, serene surroundings with natural lighting, sincere and dedicated staff providing the highest quality care and patient-centered flow and function.

The vice president of business development, Karl Hodges, wanted a hospital that was designed from the inside out by the people who understood the Guiding Principles who knew most about the current system and who were going to use the new system, namely, the doctors and nurses. Hodges and his staff spent 13 months discussing expansion needs with this group, as well as with patients and the community, before developing a proposal for the new facility. An administrative team created 35 user groups, which held over 1,000 planning meetings (lasting from 45 minutes to a whole day). They even created a "Supreme Courts" to deal with conflicting views on the multifaceted issues facing the new hospital.

Funding and regulatory issues added substantial complexity to this major expansion and Hodges was very concerned that the project stay on time and within budget. Tom Hyatt, director of facility development, was given the task of onsite manager of the \$100 million project, in addition to overseeing ongoing renovations, expansions, and other projects. The activities in the multi-year project for the new building at Arnold Palmer are shown in Table 3.7.

Discussion Questions

1. Develop the network for planning and construction of the new hospital at Arnold Palmer.
2. What is the critical path and how long is the project expected to take?
3. Why is the construction of this 11-story building any more complex than construction of an equivalent office building?
4. What percent of the whole project duration was spent in planning that occurred prior to the proposal and reviews? "Prior to the actual building construction". Why?

Table 3.7 Expansion Planning and Arnold Palmer Hospital Construction Activities and Times*

	Activity	Scheduled Time	Precedence Activity
1.	Proposal and review	1 month	—
2.	Establish master schedule	2 weeks	1
3.	Architect Selection Process	5 weeks	1
4.	Survey whole campus and its needs	1 month	1
5.	Conceptual architect's plans	6 weeks	3
6.	Cost estimating	2 months	2,4,5
7.	Deliver plans to board for consideration/decision	1 month	6
8.	Surveys/regulatory review	6 weeks	6
9.	Construction manager selection	9 weeks	6
10.	State review of need for more hospital beds ("Certificate of Need")	3.5 months	7,8
11.	Design drawings	4 months	10
12.	Construction documents	5 months	9,11
13.	Site preparations/demolish existing building	9 weeks	11
14.	Construction start/building pad	2 months	12,13
15.	Relocate utilities	6 weeks	12
16.	Deep foundations	2 months	14
17.	Building structure in place	9 months	16
18.	Exterior skin/roofing	4 months	17
19.	Interior buildout	12 months	17
20.	Building inspections	5 weeks	15,19
21.	Occupancy	1 month	20

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SECTION-A

1. Define Statistics.
2. What are the properties of standard deviation?
3. What are characteristics of a good measure of central tendency?
4. Define rank correlation coefficient. How is it determined?
5. Distinguish between correlation and regression.
6. Define probability.
7. What is Normal Distribution?
8. What is the difference between PERT and CPM?



SECTION-B

UNIT-I

9. Calculate median from the following frequency distribution.

Marks:	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Frequency:	7	15	24	31	42	30	26	15	10

10. Calculate Karl Pearson's Coefficient of skewness :

X:	12.5	17.5	22.5	27.5	32.5	37.5	42.5	47.5
f:	28	42	54	108	129	61	45	33

UNIT-II

11. Find out coefficient of correlation between X and Y

X:	17	18	19	19	20	20	21	21	22	23
Y:	12	16	14	11	15	19	22	16	15	20

12. What is a scatter Diagram? What are the merits and limitations of scatter diagram?

UNIT-III

13. The following data shows the number of seeds germinated out of 10 on a damp filter of 80 sets of seeds. Fit a binominal distribution to the data :

X:	0	1	2	3	4	5	6	7	8	9	10
f:	6	20	28	12	8	6	0	0	0	0	0

14. Three dogs A, B and C are in a dog show race. A is twice as likely to win as B and B is twice as likely to win as C. what are the respective probability of winning the race?

UNIT-IV

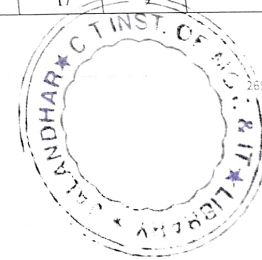
15. What is North West Corner Rule? Explain how to solve a transportation problem using North West Corner rule.
16. Describe Hungarian method in assignment problem.

SECTION-C

17. A project consists of 6 activities, The activities and their time estimation are shown below :

Activity	Time Weeks		
	Optimistic Time (t_o)	Most Likely time (t_m)	Pessimistic time (t_p)
1-2	9	12	21
1-3	6	12	18
2-4	1	1.5	5
3-4	4	8.5	10
2-5	10	14	24
4-5	1	2	3

- a) Draw the network diagram.
- b) Determine Critical path and calculate event slack.



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3. SECTION-C is COMPULSORY and consist of ONE Case Study carrying TWELVE marks.

SECTION-A

Answer briefly :

1. What are the limitations of statistics?
2. Define kurtosis.
3. What is scatter diagram?
4. What is probability?
5. Define Normal distribution.
6. What is saddle point?
7. Define least cost method.
8. Define assignment model.

SECTION-B

UNIT-I

9. Compute median from the following data :

Mid-value	115	125	135	145	155	165	175	185	195
Frequency	6	25	48	72	116	165	175	185	195

10. From the prices of shares of X and Y below find out which is more stable in value :

X	35	54	52	53	56	58	52	50	51	49
Y	108	107	105	105	106	107	104	103	104	101

UNIT-II

11. The ranking of 10 students in two subjects A and B are as follow :

A	6	5	3	10	2	4	9	7	8	1
B	3	8	4	9	1	6	10	7	5	2

Calculate rank correlation coefficient.

12. What is regression? Explain the relationship between correlation and regression.

UNIT-III

13. Twelve dices were thrown 4,096 times. Each 4, 5 or 6 spot appearing was considered to be a success while a 1, 2 or 3 spot was a failure. Calculate the theoretical frequencies for 0,1,2,..., 10 successes.
14. Solve the following game after reducing it to a 2×2 matrix.

Player A	Player B		
	B1	B2	B3
A1	1	7	2
A2	6	2	7
A3	5	1	6

UNIT-IV

15. Solve the following transportation problem using Vogel's Approximation Method :

Warehouse		Market				Supply
		P	Q	R	S	
	A	6	3	5	4	21
	B	5	9	2	7	16
	C	5	7	8	6	8
Demand		8	11	17	9	

16. A travelling salesman has to visit five cities. He wishes to start from a particular city, visit each city once and then return to his starting point. The travelling cost (in '000 Rs.) of each city from a particular city is given below :

		To City				
		A	B	C	D	E
From City	A	∞	3	6	9	2
	B	7	∞	4		3
	C	9	8	∞	5	8
	D	13	5	7	∞	6
	E	2	4	3	9	∞

SECTION-C

17. Solve the following case study :

Milwaukee Paper Manufacturing had long delayed the expense of installing advanced computerized air pollution control equipment in its facility. But when the board of directors adopted a new proactive policy on sustainability, it did not just authorized the budget for the state-of-art equipment. It directed the plant manager, Julie Ann Williams, to complete the installation in time for the major announcement of the policy, on the Earth Day, exactly 16 weeks away! Under strict deadline from her bosses, William needs to be sure that installation of the filtering system progresses smoothly on time. Given the following information, develop a table showing activity precedence relationships and find length of critical path.

Activity	Description	Immediate Predecessor	Duration (Days)
A	Build internal component	--	3
B	Modify roof and Floor	--	5
C	Construct collection stack	A	3
D	Pour concrete and install frame	A,B	4
E	Build high-temperature Burner	C	6
F	Install pollution control system	C	4
G	Install air pollution device	D,E	6
H	Inspect and test	F,G	7

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SECTION-A

Answer briefly :

- 1) What are the functions of statistics?
- 2) Define standard deviation.
- 3) What is rank correlation?
- 4) What is regression coefficient?
- 5) Define Poisson distribution.
- 6) What is duality?
- 7) Define transportation problem.
- 8) Define critical path.



SECTION-B

UNIT-I

- 9) An incomplete distribution is given below :

Variable	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	10	20	?	40	?	25	15

- i) You are given that the median value is 35. Find out missing frequency (given that total frequency = 170).
 - ii) Calculate the arithmetic mean of the completed table.
- 10) From the prices of shares of A and B below find out which is more stable in value :

A	34	53	51	52	56	58	52	50	51	49
B	108	107	105	105	106	107	104	103	104	101

UNIT-II

- 11) The ranking of 10 students in two subjects A and B are as follow :

A	5	6	3	2	10	4	9	7	8	1
B	3	8	4	9	1	6	10	7	5	2

Calculate rank correlation coefficient.

- 12) Write short note on theory of probability.

UNIT-III

- 13) Twelve dices were thrown 4,096 times. Each 4, 5 or 6 spot appearing was considered to be a success while a 1, 2 or 3 spot was a failure. Calculate the theoretical frequencies for 0, 1, 2, ..., 12 successes.

- 14) Solve the following game after reducing it to a 2×2 matrix.

Player A	Player B		
	B1	B2	B3
A1	1	7	2
A2	6	2	7
A3	5	1	6

UNIT-IV

- 15) Solve the following transportation problem using Vogel's Approximation Method :

Warehouse		Market				Supply
		P	Q	R	S	
	A	6	3	5	4	22
	B	5	9	2	7	15
	C	5	7	8	6	8
	Demand	7	12	17	9	

- 16) A travelling salesman has to visit five cities. He wishes to start from a particular city, visit each city once and then return to his starting point. The travelling cost (in '000 Rs.) of each city from a particular city is given below :

From City		To City				
		A	B	C	D	E
	A	∞	2	5	7	1
	B	6	∞	3	8	2
	C	8	7	∞	4	7
	D	12	4	6	∞	5
	E	1	3	2	8	∞

SECTION-C

- 17) Solve the following case study :

Milwaukee Paper Manufacturing had long delayed the expense of installing advanced computerized air pollution control equipment in its facility. But when the board of directors adopted a new proactive policy on sustainability, it did not just authorize the budget for the state of art equipment. It directed the plant manager, Julie Ann Williams, to complete the installation in time for the major announcement of the policy, on the Earth Day, exactly 16 weeks away ! Under strict deadline from her bosses, William needs to be sure that installation of the filtering system progresses smoothly on time. Given the following information, develop a table showing activity precedence relationships and find length of critical path.

Activity	Description	Immediate Predecessor	Duration (Days)
A	Build internal component	--	3
B	Modify roof and floor	--	5
C	Construct collection stack	A	3
D	Pour concrete and install frame	A, B	4
E	Build high-temperature Burner	C	6
F	Install pollution control system	C	4
G	Install air pollution device	D, E	6
H	Inspect and test	F, G	7

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SECTION-A

Answer briefly :

1. What is a decile?
2. What is Skewness?
3. What is linear correlation?
4. What is the regression coefficient?
5. What is Conditional Probability?
6. What is Big-M Method?
7. What is CPM?
8. What are the limitations of the least cost method in Transportation problems?



SECTION-B

UNIT-I

9. **Write notes on:**

- a) Functions of Statistics
 - b) Limitations Statistics
10. a) What are the applications of Mean Deviation and Standard Deviation?
- b) What are the applications of measures of central tendency?

UNIT-II

11. a) Discuss the business applications of correlation. Explain by citing examples
- b) What are the addition and multiplication laws of probability?
12. **Write notes on :**
- a) Bayes theorem and its applications
 - b) Why is regression considered a better technique as compared to the correlation?

UNIT-III

13. What is a normal distribution? Explain by discussing the properties and applications of normal distribution
14. **Write notes on :**
- a) Features of Poisson Distribution
 - b) Business Applications of Linear Programming

UNIT-IV

15. a) What is North-West Rule in Transportation Problems?
- b) Applications of PERT in solving business problems

16. a) Discuss the procedure of applying the MODI Method in Transportation problems
 b) Discuss in detail the Hungarian method for solving assignment problems

SECTION-C

17. a) Using Big-M Method

$$\text{Maximize } Z = x_1 + 2x_2 + 3x_3 - x_4$$

Subject to the constraints

$$x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

$$x_1, x_2, x_3, x_4 \geq 0$$

- b) Height of the fathers and sons is given below. Find the height of the son when the height of the father is 70 inches.

Father (Inches)	71	68	66	67	70	71	70	73	72	65	66
Son (Inches)	69	64	65	63	65	62	64	64	66	59	62

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SECTION-A

1. Write short notes on the following :

- (a) Mode
- (b) Quartile Deviation
- (c) Scatter Diagram
- (d) Mutually Exclusive Events
- (e) Poisson Distribution
- (f) Big-M Method
- (g) Two Person Zero Sum Game
- (h) PERT.

SECTION-B

UNIT-I

2. Differentiate between measures of central tendency and measures of variation. Briefly describe the practical application areas of measures of central tendency and measures of variation.

3. Following information is given regarding the overall miles per gallon (MPG) of 2024 small SUVs:

26, 22, 23, 21, 25, 24, 22, 26, 25, 22, 21, 21, 22, 22, 23, 24, 23, 22, 21 and 22 You are required to compute :

- (a) Compute the mean, median, and mode.

- (b) Compute the variance, standard deviation and range

UNIT-III

4. Differentiate between correlation and regression. Briefly describe the practical application areas of correlation and regression.

5. Consider the 80 households that purchased televisions that had a faster refresh rate. In the following table you see that 64 households are satisfied with their purchase and 16 households are dissatisfied.

Suppose 2 households are randomly selected from the 80 house, holds, you are required to find probability that both households are satisfied with their purchase.

UNIT-III

6. Define normal distribution. Discuss the various properties of normal distribution
7. You are required to solve the following linear programming problem :

- Maximize $Z = 5X + 2Y$

Subject to :

$$2X + 3Y \leq 420$$

$$4X + 6Y \leq 610$$

$$10X + 8Y \leq 125$$

X and $Y \geq 0$