

POKHARA UNIVERSITY
Faculty of Management

Data Analysis and Modelling

MODEL QUESTION

Section A

Very Short Answer Questions (10*2= 20 Marks)

Attempt all the questions.

1. Give two basic differences between correlation and regression.
2. Set up a 95% confidence interval estimate of the population slope β_1 if $n=25$, $b_1=5$, $b_2=10$, $S_{b1}=2$, $S_{b2}=8$
3. What do you understand by balanced and unbalanced transportation problem? Give examples.
4. What is CPM in network analysis? Give example
5. For a set of 10 data points, the sum of the squared differences between observed and estimated value of Y is 54. Given this information, what is the interpretation of standard error of estimate?
6. The correlation coefficient between two variables Y and X is - 0.78. Calculate and interpret the value of coefficient of determination.
7. Why multiple regression analysis is necessary over the simple linear regression?
8. Mention the conditions for using qualitative and quantitative forecasting. What are the methods of measuring forecast accuracy?
9. How is time series data different from cross sectional data?
10. For the following linear programming problem:
Maximize profit $Z= 40A+70B$
Subject to the constraints,
 $3A+3B \leq 36$
 $5A+2B \leq 50$
 $2A+6B \leq 60$
 $A, B \geq 0$, where optimal profit $Z=750$ at $A=3$ and $B=9$.
 - i) Which constraints are active and which are inactive?
 - ii) What are the slack and surplus values associated with each constraint?

Section B

Descriptive /Analytical Answer Questions (6*10=60 Marks)

Attempt any six questions.

11. The following data show the case sales (millions) and the media expenditures (in millions of rupees) of seven major brands of soft drinks.

Brands	Coca-Cola	Pepsi-Cola	Fanta	Sprite	Slice	Dew	7-Up
Media expenditures (Rs.)	131	92	60	56	40	29	12
Case sales	192	138	81	54	53	53	21

- i) Develop the estimating equation to predict case sales from media expenditures. Interpret the meaning of slope in this problem.
- ii) Predict the case sales for a brand with media expenditure of Rs.70 million.
- iii) Compute the coefficient of determination and interpret its meaning.

12. Suppose you are the capital budgeting officer of a small corporation whose financing requirements over the last few years have been.

Year	1997	1998	1999	2000	2001	2002	2003
Millions of Rs.	2.2	2.1	2.4	2.6	2.7	2.9	2.8

- What is the trend equation which best describe the above data?
 - Calculate the percent of trend for the above data.
 - Calculate the relative residual for the above data.
 - In which year does the largest fluctuation from trend occur, and is it the same for both methods?
13. (a) From the following data, find the appropriate price index number with due justification.

Year	Rice		Wheat		Maize	
	Price	Qty	Price	Qty	Price	Qty
1995	14	500	30	100	12	50
2005	24	400	28	80	14	40

- (b) Calculate MAD, MAPE and MSE from the following data:

Forecast value(\hat{Y})	Actual value(Y)
6.3	5.7
7.2	6.0
8.6	7.0
7.1	7.5
6.0	7.0

14. A firm makes two types of furniture chairs and tables. The profit contribution for each product as calculated by accounting department is Rs 40 per chair and Rs 80 per table. Both the products are processed on 3 machines M1, M2 and M3. The time required for each product and the total time available per for each product and the total time available per week one each machine are as follows.

Machine	Chair	Table	Available
M1	3	3	36
M2	6	3	48
M3	2	8	40

- Formulate this Linear Programming Problem.
 - Solve graphically and find the optimum value.
15. Find the optimum solution from the following transportation problem that minimizes the transportation cost.

Sources	Destinations				Supply
	1	2	3	4	
1	15	18	22	16	30
2	15	19	20	14	40
3	13	16	23	17	30
Demand	20	20	25	25	

16. (a) A department head has four subordinates, and four tasks have to be performed. Subordinates differ in efficiency and tasks differ in their intrinsic difficulty. Time each man would take to perform each task is given in the following matrix. How the tasks should be allocated to each person so as to minimize the total man-hours?

Tasks	Subordinates			
	I	II	III	IV
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

b) Write the dual of the following problem.

$$\text{Minimize } z = 3x_1 - 5x_2 + 4x_3 - 9x_4$$

Subject to the constraints:

$$x_1 - 5x_2 + 6x_3 + 2x_4 \leq 12$$

$$4x_1 + 7x_2 - 2x_3 - 3x_4 = 2$$

$$3x_1 - 8x_2 + 7x_3 - x_4 \geq 8$$

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

17. Consider the following project.

Activity	Preceding Activities	Time Estimates (days)		
		Optimistic	Most Likely	Pessimistic
A	-	3	6	9
B	-	2	5	8
C	A	2	4	6
D	B	2	3	10
E	B	1	3	11
F	C, D	4	6	8
G	E	1	5	15

- Draw the network for this project
- Calculate slacks and interpret their meaning.
- Determine critical path and interpret its meaning.

Section C

Case Analysis/ Comprehensive Question (1*20= 20 Marks)

18. Successful selling is as much an art as a science, but many sales managers believe that personal attributes are important in predicting sales success. Design Alley is a full-service interior design store that sales custom blinds, carpets and wall coverings. The store manager, Sobhit Sharma, contracted with a sales force selection company to conduct pre-hiring test on four aptitudes. Mr. Sharma has collected sales growth data for 25 of the salespeople who were hired, along with the scores from the four tests of aptitude: creativity, mechanical ability, abstract thinking, and mathematical collection. Using a desktop computer, Sharma find the following Minitab output for the best fitting multiple regressions:

Predictor	Coefficient	Stdev	t-ratio	p-value
Constant	70.1	2.13	?	0.000
CREAT	0.422	0.172	?	
MECH	0.271	0.22	?	
ABST	0.745	0.29	?	
MATH	0.42	0.07		0.00

ANOVA

Source	DF	SS	MS	F	P-value
Regression	4	1050.78	262.7	62.64	0.000
Error	20	83.88	4.19		
Total	24	1134.66			

- i) Write a regression equation for sales growth in terms of the four factor used
- ii) At a significance level of 0.05, which of the exploratory variable is significance for sales growth?
- iii) Is the overall model is significance?
- iv) Find standard error of the estimate and interpret it?
- v) How much of the variation in sales growth is explained by the aptitude test?
- vi) Jay is the new applicant with score on the four tests as follows:
CREAT=12, MECH=14, ABST=18, and MATH=30. what sales growth is prepared by the model for this applicant?

Note: In Section "C" two questions carrying 10 marks each can be asked.