POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination
December, 2015   00797

MSTE-002 : INDUSTRIAL STATISTICS - II

Time : 3 hours   *Maximum Marks : 50*

Note :   (i)   *Question no. 1 is* **compulsory**. *Question nos. 2 to 5 have internal choices.*

(ii) *Use of scientific calculator is* **allowed**.

(iii) *Use of Formulae and Statistical Tables Booklet for PGDAST is* **allowed**.

(iv) *Symbols have their usual meaning.*

1.   State whether the following statements are **True** or **False**. Give reason in support of your answer :   **2x5=10**

(a)   If there are 2 equations with 4 variables in a LPP, then the maximum number of possible basic solutions is 6.

(b)   If arrival rate is 30 per hour and service rate is 4 per hour, then the average waiting time of a customer is 4.5 minutes.

(c)   A time series is a set of values arranged in geographical order.

(d)   In a regression equation $Y = 4 + 5X + e$, the intercept of the line is 5.

(e) If the coefficient of determination is 0.933, the number of observations and independent variables are 10 and 2, respectively, then Adjusted R^2 will be 0.84.

2. (a) Rewrite the following L.P.P. in standard form : **2**

Maximize $Z = 2x_1 + x_2 + 4x_3$
Subject to the constraints :
$-2x_1 + 4x_2 \le 4$
$x_1 + 2x_2 + x_3 \ge 5$
$2x_1 + 3x_3 \le 2$
$x_1 \ge 0, \ x_2 \ge 0$ and $x_3 \ge 0$

(b) Solve the following L.P.P. using the simplex **8** method :

Maximise $Z = 100x_1 + 60x_2 + 40x_3$
Subject to the constraints :
$x_1 + x_2 + x_3 \le 100$
$10x_1 + 4x_2 + 5x_3 \le 600$
$x_1 + x_2 + 3x_3 \le 150$
$x_1 \ge 0, \ x_2 \ge 0$ and $x_3 \ge 0$

OR

Use Vogel's approximation method to obtain an **10** initial basic feasible solution of the following L.P.P :

	D	E	F	G	Availability
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

3. A marketing manager has 5 salesmen and **10** 5 products. Considering the capabilities of the salesmen and the nature of products the marketing manager estimates the sales per month (in hundred rupees) for each salesman in each district as follows :

Product

Salesman	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

Find the assignment of salesmen to product that results in maximum sale.

OR

(a) A machine shop has four machines A, B, C **6** and D. Two Jobs must be processed by each of these machines. The time (in hours) taken on each of the machines and the necessary sequence of jobs done are given below :

Job 1 :	Sequence	A	B	C	D	E
	Time	3	4	2	6	2

Job 2 :	Sequence	B	C	A	D	E
	Time	5	4	3	2	6

(b) A TV repairman finds that the time spent **4** on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in and if the arrival of sets is approximately distributed as poisson with an average rate of 12 per 10 hours a day, what is the expected idle time of repairman each day ? How many jobs are ahead on an average for a set just brought in ?

4. Sales data of 10 months for a coffee house situated   5+5
near a prime location of a city comprising the
number of customers (in hundreds) and monthly
sales (in thousand rupees) are given below :

No. of Customers :

(in hundreds)   6.0 6.1 6.2 6.3 6.5 7.1 7.6 7.8 8.0 8.1

Monthly Sales :

(in thousand rupees) 01 06 08 10 11 20 21 22 23 25

(a)   Calculate the variance of the estimated
regression coefficients.

(b)   Test the hypothesis that $H_0 : b = 8$ against
$H_1 : b > 8$ at $\alpha = 0.05$.

OR

In a study of 10 firms, a scientist collected data   10
on the delivery time (Y), distance covered (X_1) and
the packaging time (X_2) as given below :

Y   :   18 14 17 14 13 24 13 22 12 19

X_1 :   61 95 72 84 98 53 68 54 89 73

X_2 :   30 25 30 25 10 35 15 40 30 20

(a)   Estimate the parameters.

(b)   Test the significance of the regression
coefficients and interpret the results.

5.   Consider an AR (2) process given by   3+7

$X_t = X_{t-1} - 0.5 X_{t-2} + a_t$

(a)   Verify whether the series is stationary or not,
and

(b)   Obtain ρ_κ for $k = 1, 2, \_\_\_\_\_, 5$ and plot
the correlogram.

OR

The following table gives the sale figures 5+5
(in thousand) of television sets for 16 quarters over
four years from 2001 to 2004 :

Year	Quarter			
	Q_1	Q_2	Q_3	Q_4
2001	480	410	600	650
2002	580	520	680	740
2003	600	560	750	780
2004	630	590	800	840

(a) Calculate the four quarterly centered
      moving average values.
(b) Compute the seasonal indices for the data.