

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI 600034
SEMESTER EXAMINATION - NOVEMBER 2014
I M.A. ECONOMICS
EC1809 MATHEMATICS AND STATISTICS FOR ECONOMISTS

Part – A

Answer any FIVE questions.

5 x 4 = 20 marks

1. Find the value of $\begin{vmatrix} 2 & 5 & 4 \\ 0 & 4 & 3 \\ 6 & 8 & 10 \end{vmatrix}$.
2. If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ show that $A^2 = 2A$ and $A^3 = 4A$.
3. Find the derivative of $(x^2 - 4x + 5)(x^2 - 2)$.
4. Find first, second order partial derivative of $z = x^3 + y^3 - 3xy$ and also verify that $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$.
5. The coefficient of rank correlation of the marks obtained by 10 students in two particular subjects was found to be 0.5. It was then deduced that the difference in ranks in the two subjects obtained by one of the students was wrongly taken as 3 in the place of 7. What should be the correct rank correlation coefficient?
6. Find the two regression coefficients b_{xy} and b_{yx} and hence find the correlation coefficient for the following data: $x = 24$, $y = 44$, $\Sigma xy = 306$, $x^2 = 164$, $y^2 = 576$, $N = 4$.
7. A coin is tossed six times. What is the probability of obtaining four or more heads?

Part – B

Answer any FOUR questions.

4 x 10 = 40 marks

8. Solve the following system of equation by using Cramer's rule.
 $5x - 6y + 4z = 15$;
 $7x + 4y - 3z = 19$;
 $2x + y + 6z = 46$.
9. Find the maximum and minimum values of $y = x^3 - 3x^2 - 9x + 27$.
10. For a firm working under perfect competition it is given that $TC = \frac{1}{3}x^3 + 2x^2 - 7x + 6$ and $p = 5$, where x stands for level of output and p for price per unit and TC is the total cost. Find the quantity produced at which profit will be maximum.
11. Ten competitors in a beauty contest are ranked by three judges in the following order:

First Judge:	1	4	6	3	2	9	7	8	10	5
Second Judge:	2	6	5	4	7	10	9	3	8	1
Third Judge:	3	7	4	5	10	8	9	2	6	1

Use the method of rank correlation coefficient to determine which pair of judges have the nearest approach to common test in beauty?

12. The following table gives age (X) in years of cars and annual maintenance cost (Y) in hundred rupees.

X:	1	3	5	7	9
Y:	15	18	21	23	22

Using appropriate regression equation estimate the maintenance cost for a four year old car.

13. Fit a straight line trend by the method of least square to the following data. Assuming that the same rate of change continues, what would be the predicted earnings for the year 2015?

Year	2006	2007	2008	2009	2010	2011	2012	2013
Earnings (Rs. Lakhs)	38	40	65	72	69	60	87	95

14. The customer accounts of a certain departmental store have an average balance of Rs. 120 and standard deviation of Rs. 40. Assuming that the account balances are normally distributed: (i) What proportion of accounts is over Rs. 150? (ii) What proportion of accounts is between Rs. 100 and Rs. 150? (iii) What proportion of accounts is between Rs. 60 and Rs. 90? (iv) What proportion of account is less than Rs. 140?

Part – C

Answer any TWO questions.

2 x 20 = 40 marks

15. A three sector economy has the following input-output coefficient matrix $A =$

$$\begin{bmatrix} 0 & 0.5 & 0 \\ 0.2 & 0 & 0.5 \\ 0.4 & 0 & 0 \end{bmatrix}$$

The labour days required per unit of output of the three sectors are 0.4, 0.7 and 1.2 respectively and their consumer output targets are , 1000, 5000 and 4000 units respectively. Find the gross output of each sector and how many total labour days required.

16. (a) Maximize profit (π) for a firm, given total revenue $R = 4000Q - 33Q^2$ and total cost $C = 2Q^3 - 3Q^2 + 400Q + 5000$, assuming $Q > 0$.

(b) Given the following Revenue (R) and Cost (C) functions for a firm $R = 20q - q^2$ and $C = q^2 + 8q + 2$, find the equilibrium level of output, price, total revenue, total cost and profit.

17. Obtain the regression equation of Y on X and X on Y and the value of r from the following table giving the marks in Accountancy and Statistics.

	X	5-15	15-25	25-35	35-45	Total
Y						
0-10		1	1			2
10-20		3	6	5	1	15
20-30		1	8	9	2	20
30-40			3	9	3	15
40-50				4	4	8
Total		5	18	27	10	60

18. A tea company appoints four salesmen, A, B, C and D, and observes their sales in three seasons – summer, winter and monsoon, The figures (in lakhs) are given in the following table.

Seasons	Salesmen				Season's total
	A	B	C	D	
Summer	36	36	21	35	128
Winter	28	29	31	32	120
Monsoon	26	28	29	29	112
Salesmen's Totals	90	93	81	96	360

Test (i) whether the mean sales is the same for the different seasons? and (ii) whether the four salesmen differ with respect to mean sales?
