University of Kelaniya – Sri Lanka

Centre for Distance & Continuing Education
Bachelor of Arts (General) Degree Second Examination (External) - 2012
March- May 2015

Faculty of Social Sciences

Social Statistics - SOST- E2015

Mathematics for Statistics

Answer four (04) questions only

No. of questions : 06 **Time :** 03 **Hours**

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01. If

$$A = \begin{pmatrix} 2 & 4 & 8 \\ 4 & 3 & 5 \\ 2 & 4 & 1 \end{pmatrix}_{3x3} \quad B = \begin{pmatrix} 1 & 2 & 1 \\ 3 & 1 & 7 \\ 2 & 1 & 2 \end{pmatrix}_{3x3} \text{ and } C = \begin{pmatrix} 2 & 1 & 5 \\ 4 & 8 & 9 \\ 2 & 0 & 2 \end{pmatrix}_{3x3}$$

Find ;

(i) AB (05 Marks)
(ii) A+B (03 Marks)
(iii) |C| (04Marks)
(iv) $(B+C)^{-1}$ (08Marks)

02. (a) Prove that
(i) $(A^1)^1 = A$
(ii) $(A+B)^1 = A^1 + B^1$
(iii) $(A + B) + C = (A + C) + B$
(iv) $A (B+C) = AB + A C$
(v) $A (BC) = (AB) C$
Using three hypothetical matrices for A,B and C (02Marks for each)

(b) Solve the following simultaneous equations system using the Cramer's rule

$x + y + z = 7$

$x + 2y + 3z = 16$

$x + 3y + 4z = 22$ (10 Marks)

03. (a) Differentiate the following functions with respect to x

I $y = (x + 3)^2 \ (2x + 8)$ (02 Marks)

II $y = \dfrac{x^2}{x^3 + 5x + 3}$ (03 Marks)

III $y = (x^2 + 8)^4$ (03 Marks)

IV $y = 2x^4 + x^3 + 4$ (02 Marks)

(b) Find second - derivatives; **fxx**, **fxy** and **fyy** for following functions

I $f(xy) = \frac{1}{2} y^2 x^2 + 3x^4 + y^2 x^8$ (03 Marks)

II $f(x,y,z) = (xy^2 + 5z + x^2)$ (03 Marks)

III $f(x,y) = \dfrac{(5xy + 8)^2}{(x^2 y^3 + 6)}$ (04 Marks)

04. (a) Evaluate following integrals

I. $\int \dfrac{ax^3 + bx^2 + cx + d}{x} \, dx$

II. $\dfrac{x^3}{x + 1} \, dx$

III. $\int (2x + 3)^2 \, dx$

IV. $\int x (x^2 + 1)^3 \, dx$

(03 Marks for each)

(b) Evaluate the following definite integrals

(I) $\int_1^8 y \left(\sqrt{3 \quad 5 y^2} \right) dy$ (04 Marks)

(II) $\int_0^1 \dfrac{e^{4x}}{\sqrt{1 + e^{4x}}} \, dx$ (04 Marks)

05. (a) Find the values of X and Y that maximizes the functions
f (x,y) = 100 x ¾ y ¼ subject to the constraint

200x + 250 y =50000

(10 Marks)

(b) Find the values of X and Y that minimizes the function
f (x,y) = x^2 - 8x + y^2 -12 y +48 subject to the constraint

x + y = 8 ` (10 Marks)

06. (a) Find the values of x_1 and x_2 when the function

f (x_1, x_2) = x_1^3 + x_2^3 - 3 x_1, x_2 is maximized or minimized

(08 Marks)

(b) Write notes on followings

i. Identify matrices
ii. vectors
iii. symmetric matrices
iv. Partial differentiation (3Marks for each)

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