

University of Colombo
Faculty of Arts
Bachelor of Arts Degree Examination (Special) - Second Year
Semester End Examination- Semester I - 2018/2019
DMG 2122: Quantitative Methods for Demography

Answer four (04) questions only

Calculators can be used

Time: Two (02) hours

This paper contains six (06) questions and four (04) pages

1. a) Simplify the following equations

i. $\frac{4b}{a^2-b^2} + \frac{1}{b-a}$

iii. $(y+1)^2 + 5(y+1) - 4$

ii. $(p+3)^2(p+5)^2$

iv. $\frac{1}{3a-6b} + \frac{1}{a^2-4b^2}$

(08 Marks)

b) Solve the following simultaneous equations.

$$2a + 3b + 3c = 0$$

$$a + b + 2c = -3$$

$$3a - b - c = 11$$

(04 Marks)

c) Solve the following equation using a suitable formula.

$$x^2 - 5x + 6 = 0$$

(03 Marks)

2. a) Find the numerical values of the following combinations.

i. $\frac{{}^9C_4 - {}^5C_4}{{}^5C_3 + {}^5C_2}$

ii. $\frac{{}^9C_2 \div {}^4C_2}{{}^8C_3 \div {}^3C_1}$

(06 Marks)

b) Instructions have been given to answer only 8 questions from a question paper comprised of 13 questions. How many ways that a student can answer the question paper?

(02 Marks)

c) There are 5 posts available to a group of 14 members. People are selected for the posts according to their qualifications. How many ways that those posts can be filled?

(02 Marks)

d) Briefly explain the difference between the arithmetic growth model and the geometric growth model.

(05 Marks)

3. a) Solve the following simultaneous equation using matrices.

$$4p - 3q = 23$$

$$p - 2q = 7$$

(05 Marks)

b) If, $A = \begin{bmatrix} 2 & 3 & 5 \\ 1 & 1 & 4 \\ 3 & 5 & 2 \end{bmatrix}_{3 \times 3}$ $B = \begin{bmatrix} 3 & 4 & 5 \\ 5 & 2 & 9 \\ 7 & 1 & 10 \end{bmatrix}_{3 \times 3}$ find the value of $A \times B$.

(03 Marks)

c) If, $X = \begin{bmatrix} 2/3 & -12 \\ 3/4 & -6 \end{bmatrix}_{2 \times 2}$ find the determinant $[X]$ and transpose X^T of this matrix.

(03 Marks)

d) Solve the following inequalities and show them in a straight line.

i. $-3x \geq 12$

ii. $3 - 2x \leq 9$

(04 Marks)

4. a) The following contingency table shows 85 females and 82 males by their eye colour.

Colour	Black	Brown	Blue	Green	Grey
Female	20	30	10	15	10
Male	25	15	12	20	10

- i. When a person is selected randomly, what is the probability of that person having black eyes?
- ii. What is the probability of a person having brown eyes, given that the person is a female?
- iii. What is the probability that a randomly selected person will have blue eyes or will be a male?
- iv. What is the probability of randomly selected person being a female and has grey eyes?

(08 Marks)

b) Bag 'A' contains 2 red pens and 8 black pens. Bag 'B' contains 4 red 8 black pens. One pen is drawn randomly from each bag.

- i. Draw a tree diagram to show the above information.
- ii. What is the probability that both pens are red?
- iii. What is the probability that both pens being black?
- iv. What is the probability of one pen being red and the other pen being black?
- v. What is the probability of at least one pen being red?

(07 Marks)

5. a) Solve the following simultaneous equation using a graphical method.

$$a - b = -3$$

$$a + 3b = 5$$

(06 Marks)

b) i. Prepare a table for $-4 \leq x \leq 2$ to derive different values of y by using

$$y = -x^2 - 2x + 6 \text{ function.}$$

ii. Draw a graph for the function $y = -x^2 - 2x + 6$ using the above constructed table

iii. Answer the following questions using the above graph.

- a) Maximum value of the graph
- b) coordinate point of symmetry

(09 Marks)

6. a) Shade the given regions in three separate Venn diagrams.

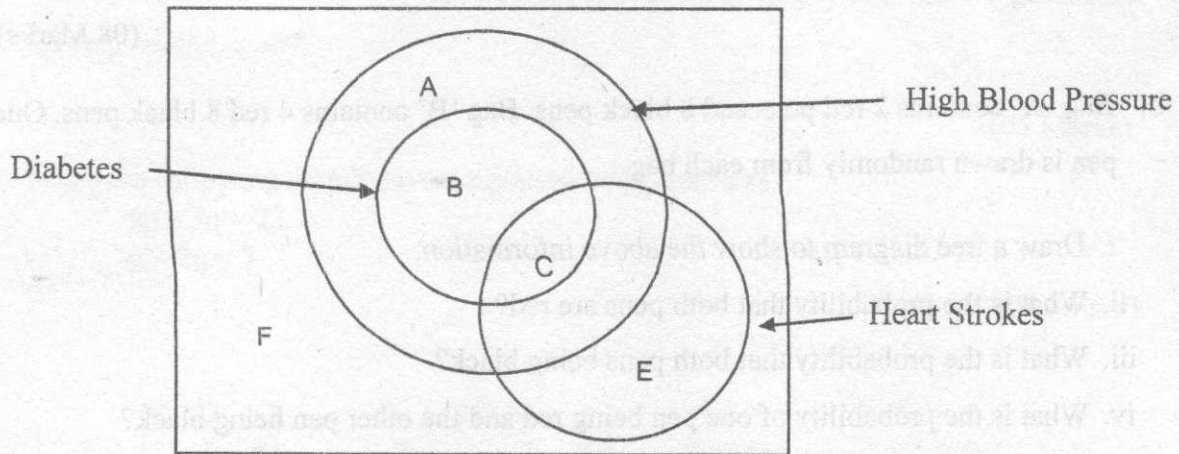
i. $(P \cup Q) \cap R^c$

ii. $P \cap (Q \cup R)^c$

iii. $P \cap Q \cap R$

(03 Marks)

b) The following Venn diagram provides information on various diseases that people in the area 'X'



c) By using above Venn diagram explain the meaning of the following.

i. A

ii. B and C

iii. F

(03 Marks)

d) From a group of 80 undergraduates 35 learn Demography, 30 learn Geography, 40 learn Economics, 14 learn Demography and Geography, 19 learn Geography and Economics, 20 learn Demography & Economics, and 8 learn Demography, Geography & Economics. Show this information in a Venn diagram and determine the following.

i. The number of students who learn only Demography

ii. The number of students who learn only one of these subjects

iii. The number of students who learn at least two of these subjects

iv. The number of students who do not learn any one of these subjects

(09 Marks)