HIGHER EDUCATION CERTIFICATE

END OF SEMESTER EXAMINATIONS - APRIL 2025

PROGRAMME: HEC

YEAR/SEM: YEAR 1/SEMESTER 1

COURSE CODE: FDN 1101

NAME: FONDATION MATHEMATICS ONE

DATE: 2025-04-22

TIME: 9:00AM-12:00PM

INSTRUCTIONS TO CANDIDATES:

1. Read the instructions very carefully

2. The time allowed for this examination is STRICTLY three hours

3. Read each question carefully before you attempt and allocate your time equally between all the Sections

4. Write clearly and legibly. Illegible handwriting cannot be marked

5. Number the questions you have attempted

6. Use of appropriate workplace examples to illustrate your answers will earn you bonus marks

7. Any examination malpractice detected will lead to automatic disqualification.

DO NOT WRITE ANYTHING ON THE QUESTION PAPER

Section A Attempt ALL Questions (Each question carries 4 marks)

Question 1:

a) Find the value of K if the sum of the roots of equation $(2k – 1)x^2 + (4k – 1) x + (K + 3) = 0$ is 5/2

Question 2:

Solve the following equations by completing the square:
a) $x^2 – 2 x – 899 = 0$
b) $2x^2 + 12x – 110 = 0$

Question 3:

a) Use the remainder theorem to determine the remainder in the case below

$$(5x^3 - 4x^2 - 3x - 6) \div (x - 3).$$

Question 4:

For what value of K the roots of the following equation are equal: $Kx^2 + 4x + 3 = 0$

Question 5:

The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

Question 6:

Find the value of each of the following:
i) $16 - 12 \times 4 + 8 \div 2$
ii) $9 - 3(17 + 5[5 - 7])$

Question 7:

Show that $\dfrac{6(x+7)}{(5x-1)(2x+5)}$ can be written in the form

$\dfrac{A}{5x-1} + \dfrac{B}{2x+5}$ Find the values of the constants A and B.

Question 8:

Find the perpendicular distance of the point (3,4) from the line 6x-3y+9=0

Question 9:

Use the factor theorem to determine the factors of $x^3 + 7x^2 + 14x + 8$ and hence solve the cubic equation $x^3 + 7x^2 + 14x + 8 = 0$

Question 10:

Rationalize the denominator in each of the following

a) $\dfrac{10}{2+\sqrt{3}}$

b) $\dfrac{4-4\sqrt{2}}{5+3\sqrt{2}}$

Section B Attempt any three (Each question carries 20 marks)

Question 1:

a) Given the two points P $(a, -b)$ and Q $(-a, b)$ where a and b are constants. Prove, that the point of origin is the mid-point of any line joining these two points.

b) A circle which passes through point P $(3, 4)$ is centered at the origin. Show that the diameter of this circle equals to 10 units. (3 marks)

c) The line which makes an angle θ with the positive direction of the x-axis is parallel to the line which passes through point of origin and the point $(3, 7)$. Find the value of θ.

d) Find the value of a which makes the line $x - y/3 - 9 = 0$ be parallel to the line joining P $(0, a)$ to $(-1, -9)$. What would the value of a be, if these two lines are perpendicular?

e) Find the equation of a straight line passing through the point $(1,1)$ and makes an angle of 45^0 with positive x- axis

Question 2:

a) The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

b) 1000 tickets were sold. Adult tickets cost $8.50, children's cost $4.50, and a total of $7300 was collected. How many tickets of each kind were sold?

c) Find the sum of 12 terms of an A.P whose nth term is given by Tn=3n+4

d) Find the 7th term of the geometric progression 2, 6, 18, ... is

e) Find the common difference of an A.P 5, 2, -1, -4, -7, ...

f) Find the equation of a straight line passing through the point (1,1) and makes an angle of 45^0 with positive x- axis

g) Find the equation of the line passing through (1, 3) and parallel to the line joining the points (7, 13) and (3, 5).

Question 3:

a) Find the coordinates of the mid points of the lines joining each of the following points:

    (i) $A(3,2), B(-3,4)$

    (ii) $R((3b-c),(2a-b/2)), S((c+b),(b/2+4a))$

b) Solve the quadratic equation below by factorization: $4x^2 +8x +3 = 0$

c) If the nth term of the progression 3, 5, 7, ... Equals to the nth term of the progression -5, -2, 1...find the value of n

d) Find the sum of the first 20 terms of the AP 2, 5, 8, 11,................

e) Find the sum of a geometric progression with 9 terms, whose first term 3 and common ratio is 2.

Question 4:

a) Given the quadratic equation $x^2 - 5x + 4 = 0$, find the roots of x using Factorization method

b) Find the value of x in the given equation $2x + \frac{x-1}{2} = \frac{5x+3}{3}$

c) Using any method, solve the given pair of simultaneous equations.

d) $2x + y = 5$ and $2x - y = 15$

e) Calculate the value of A in the formulae $A = \frac{B(C-D)(C+D)}{(3E-2F)}$ when B= 8, C = -4, D = -2, E= 5, F = -3 (answer to 2 dp)

Question 5:

a) Solve the algebraic expressions below.

   i) (x-2) (x +3)

   ii) $(x+5)^2$

   iii) $(2x^3) (5x^6)$

b) Divide $2x^2 - x - 10$ by x+2 by long division

c) The solutions to the simultaneous equations 6X-2Y=34 and 5X+3Y=26 are?

d) If 2x, x+10, 3x+2 are in an arithmetic progression, then x is equal to

e) Find the equation of the line passing through (1, 3) and parallel to the line joining the points (7, 13) and (3, 5).

f) Find the solution to the equation 4(x - 2) - 2(x - 6) = 3(x + 1)

Question 6:

a) What is the nth term of the AP 7, 9, 11, 13 … ……, and hence find the 100th term.

b) A ball rolls down a slope so that it travels 4 cm in the 1st second, 7 cm in the 2nd second, 10 cm in the 3rd second and so on. How does it travel in
   (i)   The 7th second
   (ii)   The nth second

c) The first term of an AP is 1 and the last term equals to 28. Find the sum of the terms of this AP, if the number of terms equals to 10.

d) A water container poured water into 250 m^3 in the first day, then everyday it is poured 4/5 the amount of the previous day. If the container is filled after 5 days, find the internal volume of the container