INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

HIGHER EDUCATION CERTIFICATE

END OF SEMESTER EXAMINATIONS - DECEMBER 2025

PROGRAMME: HEC
YEAR/SEM: YEAR 1/SEMESTER 2
COURSE CODE: FDN 1201
NAME: FONDATION MATHEMATICS TWO

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Attempt all questions (each question carries 4 marks)

Question 1:

A bag contains 4 red marbles and 5 blue marbles. You draw a marble without looking, and then you draw a second marble without replacing the first. What is the probability of drawing a red marble then a blue marble?

Question 2:

Use the first principle method to find dy/dx of

$Y=4x^2 + 3x$

Question 3:

For each of the following functions, find the value of x at which $\frac{dy}{dx} = 0$:

i. $y = x^4 - 108x$

ii. $y = \frac{7}{3}x^3 - 7x^2 + 7x$

Question 4:

Find the derivative of the function below

$$y = \frac{1}{5}x^{10} - \sin x + 2\tan x - \frac{x^9}{3} + x^6$$

Question 5:

For five entries, the following values were calculated between two variables x and y

$\sum x = 14 \quad \sum x^2 = 22 \quad \sum y = 942 \quad \sum y^2 = 170552 \quad \sum xy = 1565$

Calculate to two decimal points the Pearson's coefficient of correlation

Question 6:

Integrate the following function;

$$\int(8x^7 + 14x^6 + 12x^5 - 5x^4 - 4x^3 + 3x^2 + x - 8)dx$$

Question 7:

Find the value of the following

$$\int_2^3 (2x+1)dx$$

Question 8:

Find the value of $\int_2^3 \frac{x^3 + 2x^2 - x}{x} dx$

Question 9:

If $y = \cot x$, show that $\frac{dy}{dx} = -(\text{cosec}\, x)^2$

Question 10:

Use the product rule to find the gradient of the curve below;

$$y = (1+x^3)(1+\cos x)$$

Question 11:

a) The given data set shows marks of 10 students in a Math test marked out of 20.

15, 14, 14, 15, 15, 14,15, 16, 13, 18

Use the data above to compute the

i) Mean

ii) Median

Question 12:

The following data represent the marks of 20 students.

80	76	90	85	80
70	60	62	70	85
65	60	63	74	75
76	70	70	80	85

Use the marks above to construct a frequency distribution table for the ungrouped data

Question 13:

Mr. Mohammed has a coin that has two side i.e a head(H) and a tail(T). What is the probability of flipping his fair coin twice and get heads?

Question 14:

Using Simple Average of Relatives Method, find price index for 2004, taking 2000 as base year

Commodity	A	B	C	D	E
Price in 2000	15	16	60	40	20
Price in 2004	20	20	80	50	25

Question 15:

The table below indicates marks obtained by students in a statistics test. Compute the mean mark of the class

Mark (x)	Frequency (f)
0	2
1	4
2	7
3	10
4	8
5	5
6	1

Question 16:

From the following data, construct the price index for each year with price of 1995 as base.

YEAR	1995	1996	1997	1998	1999	2000
PRICE	40	50	45	55	65	70

Question 17:

The wages of a certain group of workers in 2024 was 2,000,000 and in 2025 it was 2,500,000. Using 2024 as a base year, calculate the workers' wage index in 2025.

Question 18:

Calculate the gradient of the curve $y=2x^5-3x^3+x-5$ at the point (3,4)

Question 19:

$$\text{If } y = \tan x, \text{ prove that } \frac{dy}{dx} = sec^2\, x$$

Question 20:

$$\text{If } y = (x-1)(x^2+3) + \frac{4x}{x-1}, \text{show that at } x = \frac{1}{2} \quad , \qquad 4\frac{dy}{dx} = -53$$

SECTION B

Attempt any three question (Each question carries 20 marks)

Question 1:

a) The table below shows the marks obtained out of 50 by semester two students at IUEA in a mathematics contest

Marks	Number of students
1-10	9
11-20	10
21-30	11
31-40	8
41-50	7

Use the above frequency table to find;

i) Mean

ii) Mode

iii) Median

iv) The lower quartile

Question 2:

A doctor asked ten of his patients who were smokers how many years they had smoked. In addition, for each patient, he gave a grade between 0 to 100 indicating the extent of their lung damage. The following table shows the results:

Patient	Number of years smoking	Lung damage grade
A	15	30
B	22	50
C	25	55
D	28	30
E	31	57
F	33	35
g	36	60
H	39	72
I	42	70
J	48	75

(a) Calculate Spearman's coefficient of rank correlation between the number of years of smoking and the extent of lung damage.
(b) Comment on the figure which you obtain

Question 3:

a) The table shows the initial salaries in (UGX 000) of employees in a certain factory

Annual salary	Number of graduates
1000	3
2000	6
3000	12
4000	9
5000	3
6000	2

Use the table to calculate;

i) mean
ii) median
iii) variance
iv) standard deviation
v) coefficient of variance

Question 4:

The table shows the inputs (X) and harvests (Y) made by a farmer during a certain harvest season.

X	4.3	6.9	0.0	10.4	5.2	1.8	8.0	9.2	2.1
Y	224	208	123	419	230	184	362	351	196

a) Use the Pearson's coefficient of correlation to determine if there is a connection between X and Y
b) Calculate the regression equation line of y on x
c) Calculate the harvest made that were corresponding with the following harvests
   i) 8.0
   ii) 6.9
   iii)0.0

Question 5:

The table below shows the marks obtained by 10 students in Foundation mathematics and Foundation physics.

Mathematics	Physics
80	50
80	45
70	70
60	90
65	70
80	90
68	70
90	80
95	70
50	95

a) Find the spearman's rank correlation coefficient
b) comment on your result.

Question 6:

a) Determine the following integrals

i) $\int 4\sec^2 x \; dx$

ii) $\int \frac{3x^2-5x}{x} \; dx$

iii) $\int \frac{4}{3x^2} \; dx$

b) Evaluate the following definite integrals

i) $\int_1^3 (x^2 - 4x + 3)dx$

ii) $\int_{-1}^{1} \frac{-3}{4} t^2 dt$

iii) $\int_0^2 x^2\sqrt{x^3+1} \; dx$

c) Find the value of a such that $\int_0^a \frac{x^3+x^2+9x+9}{x^2+9} . dx = 4$

Question 7:

Using simple average of price relative method, find price index for each of the following

i) For 2004, taking 2000 as a base year

Commodity	A	B	C	D	E
Price in 2000	15	16	60	40	20
Price in 2004	20	20	80	50	25

ii) For 2001, taking 1999 as abase year

Commodity	Wheat	Rice	Sugar	Ghee	Tea
Price (per unit) in 1999	10	20	60	40	16
Price (per unit) in 2001	12	22	80	50	20

Question 8:

a) If $y = tanx$, show that $\frac{d(tanx)}{dx} = \sec^2 x$

b) Use the quotient rule to find;

i) $y = \frac{2x^2}{3x^3-4}$

ii) $y = \frac{5x-1}{3x+2}$

c) Use the product rule to find $\frac{dy}{dx}$

i) $y = (x^2 - 1)(3x + 2)^3$

ii) $y = (x^3 + cosx)(3x + \sin x)$

d) Find the gradients of the following curves at different points;

i) $y = 3x^2 - 2x + 1$ at $x = 2$

ii) $y = x^3 - 1$ at $x = -1$

Question 9:

a) Three weighing scales from three different stalls, W, X and Y in Owino market were used to weigh 10 bags of beans A, B, C…J and the results (in kgs) were as given in the table below One of the scales was known to be in good working condition.

	A	B	C	D	E	F	G	H	I	J
Scale W	65	68	70	63	64	62	73	75	72	78
Scale X	63	68	68	60	65	60	72	73	70	66
Scale Y	63	74	78	75	64	73	79	70	67	79

Determine rank correlation coefficient for the performances of the scales

i)W and X

ii) X and Y.

iii) Which of the three scales: W, X and Y were in good working conditions.

Question 10:

a) Convert the degrees into radians

   i) 90

   ii) 60

   iii) – 180

b) Convert the following radians into degrees

   i) $\pi/6$

   ii) $7\pi/5$

c) A 25 m long ladder is placed against a vertical wall of a building. The foot of the ladder is 7m from base of the building. If the top of the ladder slips 4m, then the foot of the Ladder will slide by how much distance.

d) Given that 3θ is an acute angle and $\sin 3\theta = \cos 2\theta$, find the value of θ.