TEVETA
Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA IN BIOMEDICAL ENGINEERING TECHNOLOGY

LEVEL 6 YEAR II EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: JULY/AUGUST 2025

SUBJECT: ENGINEERING MATHEMATICS II

TIME: THREE (3) HOURS. **TOTAL MARKS: 100**

INSTRUCTIONS TO CANDIDATE **PASS MARK: 50**

1. Write your Examination number and National Registration Card (NRC) number on the answer booklet provided. Ensure you append your signature in the space provided on the answer booklet.
2. Write the ANSWER SCRIPT SERIAL NUMBER on the examination register and on the entry slip.
3. There are EIGHT (8) Questions in this paper
4. Answer Five (5) Questions
5. Cell phones and programmable calculators are not allowed in the examination room

DO NOT TURN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

QUESTION 1

a) The summary results of an experiment in which Y depends on X is as follows:

$$\sum x = 70, \sum x^2 = 1\,350, \quad \sum Y = 67, \quad \sum XY = 975, \quad n = 4$$

Required:

i) Determine the regression equation. **[6 marks]**

ii) Compute the value of x when $y = 12.8$. **[3marks]**

b) The price of drawing boards of a shop during a certain week is distributed as follows:

Price of drawing board	500	1000	1500	2000
Number of boards	4	10	8	6

Required:

i) Determine the mean. **[3 marks]**

ii) Determine the standard deviation of the prices. **[6 marks]**

iii) Coefficient of variation of the price of drawing boards. **[2 marks]**

[Total: 20 marks]

QUESTION 2

A function generating the wave is given by

$$f(x) = \begin{cases} x, & x < 0 < \pi \\ 0, & \pi < x < 2\pi \end{cases}$$

Determine the Fourier series for the function $f(x)$. **[20 marks]**

[Total: 20 marks]

QUESTION 3

a) Evaluate $\lim_{x \to -4}(5x^2 + 8x - 3)$. **[4 marks]**

b) Compute

i) $\left[\lim_{x \to 6} \frac{(x-3)(x-2)}{x-4}\right]$ **[6 marks]**

ii) $\lim_{x \to 3}\left(\frac{x^2-9}{x-3}\right)$ **[6 marks]**

c) Evaluate $\lim_{x \to 0}\left(\frac{\sin x}{x}\right)$ **[4 marks]**

[Total: 20 marks]

QUESTION 4

a) Determine:

$$\mathcal{L}^{-1}\left\{\frac{4s-5}{s^2-s-2}\right\}$$

[8 marks]

b) Use the Laplace transform of the second derivative to derive

$$\mathcal{L}\{\cos at\} = \frac{s}{s^2+a^2}$$

[7 marks]

c) Determine the Laplace transforms of

$$5e^{-3t}\sinh 2t$$

[5 marks]

[Total: 20 marks]

QUESTION 5

a) Determine $\int\left(\frac{2x^2+1}{x}\right)dx$. **[5 marks]**

b) Evaluate $\int_0^1 2e^{6x-1}\,dx$, correct to 4 significant figures. **[6 marks]**

c) The curve $y = x^2 + 4$ is rotated one revolution about the x-axis between the limits x=1 and x=4. Determine the volume of solid of revolution produced. **[9 marks]**

[Total: 20 marks]

QUESTION 6

a) The number of issues of tools from a store in a factory is observed for seven one-hour periods in a day, and the results of the survey are as follows:

Period	Number of issues
1	34
2	17
3	9
4	5
5	27
6	13
7	6

Present this information on a simple bar chart. **[8 marks]**

b) Given the following data set 2,3,7,5,5,13,1,7,4,8,3,4,3. Determine

i) median. **[4 marks]**

ii) mode. **[4 marks]**

iii) variance. **[4 marks]**

[Total: 20 marks]

QUESTION 7

a) Calculate the probabilities of selecting at random:

i) The winning horse in a race in which ten horses are running, **[5 marks]**

ii) The winning horses in both the first and second races if there are ten horses in each race. **[5 marks]**

b) Students take two independent tests. 40% of students pass test A and 70% pass test B. Determine the probability that a student selected at random passes.

i) Both tests. **[3 marks]**

ii) Only test A **[2 marks]**

iii) Only one test **[5 marks]**

[Total: 20 marks]

QUESTION 8

Differentiate the following:

a) $y = \frac{3t+5}{2t-1}$ **[5 marks]**

b) $y = (t^4 + 5t^2 - 3)^8$ **[5 marks]**

c) $y = \frac{1}{\sqrt{5t^2+3}}$ **[5 marks]**

d) $y = \ln cos2t$ **[5 marks]**

[Total: 20 marks]