S475/1
SUBSIDIARY MATHEMATICS
2022
2hrs:40minutes

MATIGO MOCK EXAMINATIONS 2022

Uganda Advanced Certificate of Education

Subsidiary mathematics (S475/1)

2**Hours:40minutes**

INSTRUCTIONS TO CANDIDATES:

*Answer **all** the eight questions in section **A** and any **four** from section **B***

Any additional question(s) answered will not be marked

All working must be shown clearly

Graph paper is provided

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

In numerical work, use $\boldsymbol{g = 9 \cdot 8ms^{-2}}$

SECTION A: (40 MARKS)

*Attempt **all** the questions in this section*

1. Express $\frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ in the form of $a + b\sqrt{c}$. Hence find the value of a, b, c *(05 marks)*

2. Mutually exclusive events A and B are such that $P(A) = 0.5$ and $P(AuB) = 0.9$. Find:

(i) $P(B)$ *(03 marks)*

(ii) $P(AUB)'$ *(02 marks)*

3. Solve for x in the equation: $2^{2x} - 12(2^x) + 32 = 0$ *(05 marks)*

4. Find the sum of the series: $2+4+6+8+10+ \text{-----} +146$ *(05 marks)*

5. The roots of the equation $2x^2 + 4x - 1 = 0$ are α and β. Find the value of $\alpha^2 + \beta^2$. *(05 marks)*

6. Solve the differential equation $\frac{dy}{dx} = 2x + 5$, given that $y = -1$ when $x = 3$. *(05 marks)*

7. In a certain family of three children, the chance of having a boy is $\frac{2}{3}$.

Find the probability of having:

(i) exactly two are boys *(02 marks)*

(ii) at least two are boys *(03 marks)*

8. A car travelling at $50ms^{-1}$ accelerates uniformly to $80ms^{-1}$ in $10\ s$. Find the acceleration and distance it travelled in $10\ s$.

(05 marks)

SECTION B: (60 MARKS)

*Answer **only four** questions from this section.*

9. (a) Show that the vectors $\boldsymbol{m = 3i + 2j}$ and $\boldsymbol{n = 8i - 12j}$ are perpendicular. ***(05 marks)***

(b) Given that the vectors $\boldsymbol{a = i - 2j, b = 3i - j}$ and $\boldsymbol{c = i + 2j,}$ find the length of the vector $\boldsymbol{5a - b + 3c}$ ***(05 marks)***

(c) Find the angle between the vectors $\boldsymbol{u = 2i + 2j}$ and $\boldsymbol{v = 3i - 2j}$ correct to one decimal place. ***(05 marks)***

10. (a) (i) Find $\int \boldsymbol{3x^2 + 2x + 4\ dx}$ ***(02 marks)***

(ii) Given that $\boldsymbol{y = (x^2 - 1)(2x + 4),}$ find $\dfrac{\boldsymbol{dy}}{\boldsymbol{dx}}$ ***(03 marks)***

(b) Find the coordinates and the nature of the turning point of the curve $\boldsymbol{y = 5 + x - x^2}$**.** Hence sketch the curve**.** ***(10 marks)***

11. The table below shows the weights in ***kg*** of ***30*** pupils.

48	***44***	***33***	***52***	***54***	***44***
53	***38***	***37***	***35***	***53***	***46***
59	***51***	***32***	***37***	***49***	***42***
48	***59***	***52***	***40***	***54***	***46***
45	***62***	***35***	***54***	***48***	***35***

(i) Construct a frequency table with a class width of ***5*** starting from the class of ***30 −34***. ***(02 marks)***

(ii) Calculate the mean and the variance of the distribution ***(07 marks)***

(iii) Display the above data on a histogram and use it to estimate the mode. ***(06 marks)***

12. (a)A discrete r·v ***X*** has the following probability distribution**:**

X	***0***	***1***	***2***	***3***	***4***	***5***
P(X=x)	***0·1***	***0·15***	***2a***	***0·2***	***A***	***0·1***

Find**:**

(i) the value of ***a*** ***(03 marks)***

(ii) the expected value of ***X*** ***(03marks)***

(iii) the variance of ***X*** ***(05 marks)***

(iv) the standard deviation of ***X*** ***(02 marks)***

(v) $P(1 < X \leq 4)$ ***(02 marks)***

13. (a) Two bodies of mass ***3kg*** and ***5kg*** are held by a light inextensible string passing over a smooth light fixed pulley. Find the common acceleration and the tension in the string. ***(05 marks)***

(b) ***ABCD*** is a rectangle with sides ***AB = 4cm*** and ***BC = 3cm.***

Forces of magnitude ***1N, 2N, 3N, 5N*** and ***4N*** act along ***AB, BC, CD, D,*** and ***AD*** respectively in the directions indicated by the order of the letters. Find the magnitude and direction of the resultant force. ***(10 marks)***

14. The masses of the boxes are normally distributed with mean ***134g*** and variance ***25g.*** Find the probability that a box selected at random weighs***:***

(i) less than ***124g.*** ***(05 marks)***

(ii) more than ***140g*** ***(05 marks)***

(iii) between ***125g*** and ***143g*** ***(05 marks)***

END