END OF TERM 3 EXAMS S.5 MATHEMATICS

PAPER 1

TIME: 3HOURS

INSTRUCTIONS

- *Attempt all items in section A and any **three** of your choice in section B*
- *Any extra item answered will **not** be marked*

SECTION A

Attempt all items in this section

Item 1

In a sports competition the formulae $\boldsymbol{P = 0.1186(253 - t)^{1.94}}$ is used to calculate the number of points **(p)** awarded in 800m event, where **t** is the time in seconds taken by the athlete for the race. Find the:

a) Athlete's time, if the scores is 953

b) Athlete's score points, if he uses 30 minutes

Item2

Towers need to be equidistant for proper communication of signals in villages, an engineer choses three points for the towers randomly in lira town. ***A (1,2), B (3,4), C (5,2).***

Task

Help the engineer identify if the points **A, B and C** are equidistant

Item 3

A Community is installing anew water pump. The rate of water flow can be modelled by expression $\frac{\mathbf{2\tan^2\theta}}{\mathbf{\sin(2\theta)}}$ where $\boldsymbol{\theta}$ is the flow angle.

Task

a) Prove to the community that the rate of flow can also be modelled as $\boldsymbol{tan\theta sec^2\theta}$

b) If the angle of flow is 45^0. show that the rate of flow is **2 units**

Item 4

Student performance is $\boldsymbol{p(r) = \frac{2r^2+11r+12}{(r+3)(r+4)}}$ % pass rate, where r is the resource ratio

Task

Express in partial fraction the teaching resource ratio.

Item 5

A coffee farmer in Gulu has a profit function given $\boldsymbol{p(x) = -x^2 + 10x - 500}$

where p is in thousands of shillings and x is a mount of fertilizers used in kilograms

Task

What is the maximum profit the farmer can make.

Item 6

The Uganda telecom is installing a communication tower on mountain Rwenzori from two observation points **A** and **B** ,**500meters** apart at the same elevation point. the angles of elevation to the tower top are $\mathbf{25^0}$ and $\mathbf{35^0}$ respectively.

Task

Find the distance from each observation point to the base of the tower.

Item 7

A microfinance institution in Uganda gives a loan of 2,000,000 shillings to a small business owner. The repayment schedule requires the owner to pay 100,000shilings in the first month and decreases the payment by 5,000shilngs each subsequent month.

Task

a) What a mount is paid in the 15^{th} month
b) How much amount will he pay in total after 10 subsequent months.

Item 8

The area of the park in masaka Gayaza is bounded by the function curves $\boldsymbol{y_1 = 0}$ (x-axis) and $\boldsymbol{y_2 = x^3 - 6x^2 + 8x.}$

Task

a) Evaluate the intersection point(s) x for $\boldsymbol{y_1}$and $\boldsymbol{y_2}$
b) Help find the total area of the park.

SECTION B

*Attempt any **three** items of your own choice*

Item 9

A construction company in Entebbe pays workers such that each day pays ***1.5times*** the previous day pays. The first day pays ***20,000 UGX***

Task

a) Identify the sequence type and what is the payment on the 7th day
b) Calculate the total payment for 10days of work
c) If the project lasts for 15days, what will be the payment on the last day

Item 10

A production company in Wakiso needs to minimize the cost of transporting vegetables. The function is given by $\boldsymbol{C(x) = \frac{x^2}{20} - 10x + 100}$ where x is the distance in kilometres and C is the cost in shillings.

Task

a) Find the distance at which the transportation cost is at its minimum.
b) What is the minimum transport cost?
c) How can the company use this information to plan its delivery routes.

Item11

A coffee farm in Mbale uses a sprinkler system where water coverage follows the $\boldsymbol{y = 4 - x^2}$ in (hundreds square meters) for $\boldsymbol{x = 0}$ and $\boldsymbol{x = 2}$ representing distance from the main pipe in kilometres

Task

a) Find the total irrigated area under the coverage curve bounded by the x-axis (hundreds square meters)
b) The farm also has a secondary irrigation system following $\boldsymbol{y = x^2}$ .What is the area between the two irrigation curves. (hundreds square meters)
c) If the sprinkler rotates to create a solid revolution about the x-axis. what is the volume of water cover zone in (cubic kilometres).

Item 12

A radio station located at Old Kampala hill is broadcasting a signal. The signal strength at a given locations modelled by $\boldsymbol{S(x) = \frac{1+sinx}{1-sinx}}$ where x is the parameter related to the receiver's position.

Task

a) Prove that the signal has a similar strength of $\boldsymbol{(secx + tanx)^2}$
b) Give that parameter lie between $\boldsymbol{0^0}$ to $\boldsymbol{360^0}$ inclusive, find the possible parameter(s) if $\boldsymbol{S(x) = 2}$

Item 13

The Uganda national roads Authority (UNRA) is planning anew feeder road L_1 that must be perpendicular to a section of Northen bypass L_2. The equation of the by pass is $\boldsymbol{y = 3x + 10}$. The new feeder road must pass through anew industrial park located at $\boldsymbol{P(9, 4)}$.

Task

a) How steep /slanting is the new feeder road L_1
b) State the equation represented by the feeder road.
c) At what point did the two roads L_1 and L_2 meet

END

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