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**GARISSA UNIVERSITY**

**OFFICE OF THE DEPUTY PRINCIPAL ACADEMIC AND STUDENT AFFAIRS**

**UNIVERSITY EXAMINATION 2021/2022 ACADEMIC YEAR TWO SECOND SEMESTER EXAMINATION**

**DEPARTMENT OF COMPUTER & INFORMATION SCIENCES**

**COURSE CODE: DIT 027**

**COURSE TITLE: MATHEMATICS FOR INFORMATION TECHNOLOGISTS II**

**DATE: TIME:**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions.**
* **Question one (1) is COMPULSORY (must be done).**
* **Choose any other TWO (2) questions from remaining FOUR (4) questions.**

**This paper consists of FOUR (4) printed pages please turn over**

**QUESTION ONE - COMPULSORY (30 MARKS)**

a) Let A denote “Gees are foobles” and B denote “Dobbies are tootles”. Write the English sentences corresponding to the following:  **(4marks)**

1. A$˄$B
2. $¬A\rightarrow B$
3. $¬(A\rightarrow B)$
4. A$˄$B$\leftrightarrow $ $¬B$

b) Construct the truth table for the following compound proposition stating whether a fallacy, tautology or indeterminate:$ $

$ \left[\left(P\rightarrow q\right)˄(q\rightarrow r)\right]\rightarrow (p\rightarrow r)$. **(6marks)**

c) The data below shows the recording of frequency of people in a market.

1. 3 109 111 102. Find the:
2. Arithmetic mean **(2 Marks)**
3. Geometric mean **(3 Marks)**
4. Harmonic mean **(3 Marks)**
5. Show that:

i) $tanθ+cotθ= \frac{1}{SinθCosθ}$. **(4 marks)**

ii) $\left[\begin{matrix}n+1\\r+1\end{matrix}\right]= \left[\begin{matrix}n\\r\end{matrix}\right]+\left[\begin{matrix}n\\r+1\end{matrix}\right]$ **(8 marks)**

**QUESTION TWO (20 MARKS)**

1. Find the transpose of the square matrix A given by A=$\left[\begin{matrix}0&2&5\\-2&0&9\\-5&-9&0\end{matrix}\right]$. State the type of this matrix**. (2marks)**
2. Solve the following system of linear equations by Crammer’s rule: **(4 marks)**

$$ 2x+4z= -6$$

$$ 3x-y+3z= -4$$

$$ x+y-2z=6$$

1. The table below shows the age distribution of workers in a cotton factory.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Age(years) | 16-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 |
| Frequency | 2 | 10 | 12 | 17 | 15 | 9 | 5 |

a) Calculate the mean age to the nearest years. **(3 marks)**

b) Estimate the median age. **(4marks)**

c) Estimate the modal age and the 40th percentile. **(5marks)**

d) Calculate the variance and Standard Deviation for the ages of the workers in the factory.

 **( 2 Marks)**

**QUESTION THREE (20 MARKS)**

Market segmentation is known as the process of dividing up a market for goods or services into smaller groups, e.g geographic and psychographics. A total of 1800 advertisements were run to try and reach various segments. The following list shows the breakdown of each:

680 for a geographic location.

500 based on demographics

440 based on psychographics \385 based on both demographics and geographic.

245 based on psychographics and geographic.

325 based on both demographics and psychographics.

245 based on the three segments.

Using a Venn diagram, find the number of:

i) Run either for geographic and demographics. **(5marks)**

ii) Not run for geographic **(5marks)**

iii) Not run for any of these segments. **(5marks)**

iv) Not run for geographic but were run for demographics. **(5marks)**

**QUESTION FOUR (20 MARKS)**

1. There are three copies each of four different books. In how many ways can they be arranged in a shelve? (Leave your answer in factorial form). **(4marks)**

1. An arithmetic progression has the first term as **a** and the common difference as **d**.
2. Write in terms of **a** and **d**, the 3rd, 9th and 25th terms of the progression**.(4 marks)**
3. The progression is increasing and the 3rd, 9th and 25th terms form the first three Consecutive terms of a geometric series. If the sum of the 7th term and twice the 6th term of the arithmetic progression is 78.

 Calculate:

1. The first term and the common difference of the arithmetic progression. **(8 marks**)
2. Find the sum of the first nine terms of the A.P.  **(4marks)**

**QUESTION FIVE (20 MARKS)**

1. Given the following transaction matrix. Obtain the input output matrix.

|  |  |  |
| --- | --- | --- |
| Production sector | Purchase sector | Projected demand  |
| Agriculture  | Industry  |
| Agriculture | 300 | 600 | 100 |
| Industry  | 400 | 1200 | 400 |

 If the projected demand changes to 200 and 800 units respectively. What should be the gross output of each sector in order to meet the new demand? (10**marks)**

b) Use mathematical induction to prove that $1^{3}+2^{3}+3^{3}+…+n^{3}=\begin{matrix}n\\\sum\_{}^{}\\i=1\end{matrix}i^{3}$ $\left[\frac{1}{2}n(n+1)\right]^{2}$.

**(7marks)**

c) Prove that there is no rational number whose square is 3. **(3marks**