**KABARAK UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**MAIN CAMPUS**

**SECOND SEMESTER 2020/2021 ACADEMIC YEAR**

**EXAMINATION FOR THE DEGREE SCIENCE IN COMPUTER SCIENCE AND ACTUARIAL SCIENCE**

**MATH 111 VECTOR GEOMETRY**

**STREAM: Y1/S1 - REGULAR TIME:9:00-11:00AM**

**EXAMINATION SESSION: MAY- AUGUST DATE: 19/08/2021**

**INSTRUCTIONS TO CANDIDATES**

1. **Attempt Question 1 and any other two questions in the answer booklet provided.**
2. **Do not write on your question papers. All rough work should be done in your answer booklet.**
3. **Clearly indicate which question you are answering.**
4. **Write neatly and legibly.**
5. **Edit your work for language and grammar errors.**
6. **Follow all the instructions in the answer booklet**

**SECTION A: (COMPULSORY) TOTAL MARKS FOR THIS SECTION IS 30.**

1. Find the vector equation of a line passing through the points and [3 Marks]



1. The Cartesian equation of a straight line is given below express it in vector form.
   * 1. . [4 Marks]



1. Find the magnitude and direction of the displacement vector where *P* and *Q* are pointsand respectively. [4 Marks]



1. Find the area of a triangle whose vertices are [4 Marks]



1. Evaluate. [4 Marks]



1. Find the angles which the vector makes with the coordinate axis. [4 Marks]



1. Show that the line lies on the plane  [4 Marks]
2. Determine the value of  such that the vectors and are orthogonal. [3 Marks]



**SECTION B. TOTAL MARKS FOR THIS SECTION IS 40.**

**ANSWER ANY TWO QUESTIONS FROM THIS SECTION. EACH QUESTION IN THIS SECTION CARRIES 20 MARKS.**

1. A force of 5N is inclined at an angle of 450 to a second force of 8N, both force acting at a point. Find the magnitude of the resultant of these two forces and the direction of the resultant with respect to the 8Nforce by the parallelogram method [2 Marks]
2. A constant force of **F** = 10**i** + 2**j** – **k** Newton’s displaces an object from **A** = **i**+ **j**+ **k** to (in metres). Find the work done in newton metres [4 Marks]
3. Find a vector equation of the line which passes through the point and is parallel to the line  where and  are the points with the coordinates  and . Hence show that the point lies on the line. [4 Marks]



1. ABCD is a quadrilateral in which P and Q are the mid points of the diagonals AC and BD respectively. Show that [4 Marks]



1. The vector equations of three lines are given below

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State which of the lines are [6 Marks]

1. Parallel
2. Intersect
3. Skewed
4. Find both the Cartesian and vector forms of the equation of the line of intersection of the two planes****and**** [6 Marks]
5. Find the distance of the point from the plane  [6 Marks]
6. AT noon two boats P and Q are at points where position vectors are and respectively. Both boats are moving with a constant velocity; the velocity of P is and the velocity of Q is where all distances are in kilometers and time measured in hours.



1. Find the position vectors of P and Q and after *t* hours. [4 Marks]



1. Express the distance PQ between the boats in terms of *t* [2 Marks]
2. Show that the least distance between the boats is km [2 Marks]



1. Show that given that and [4 Marks]



1. Given that and find



1. [2 Marks]



1. The angle between the two vectors and [3 Marks]



1. Given that *A, B* and *C* are the points, and respectively find the equation which must be satisfied by the coordinates of any point *P* in the plane *ABC*. [6 Marks]



1. Find the point of intersection of the lines and  [5 Marks]
2. Find the vector equation of a plane which passes through the point  and has normal vector. Hence
3. Find its Cartesian equation and
4. Show that the points  and  lie on the plane
5. Sketch the plane [8 Marks]
6. Given that *A* is the point, *B* is the point and *C* is the point,
7. find the direction cosine of and 
8. show that the  [6 Marks]
9. Find the volume of a parallelepiped whose edges are represented by and [6 Marks]

