

**KABARAK**



**UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**2015 / 2016 ACADEMIC YEAR**

**FOR THE DEGREE OF BACHELOR OF COMMERCE AND  
BACHELOR OF BUSINESS MANAGEMENT & INFORMATION  
TECHNOLOGY**

**MATH 110: BASIC MATHEMATICS**

**DAY: THURSDAY**

**DATE: 14/04/2016**

**TIME: 2:30 – 4:30PM**

**STREAM: Y1S1**

*Instructions*

*Answer question ONE and any other TWO*

**QUESTION ONE**

**(30MARKS)**

a) A survey was conducted on a sample of 200 new cars being sold at a local auto dealer was conducted to see which of the three popular options, air conditioning(A), Radio (R) and power window (W), were already installed. The survey found

120 had air conditioning, 96 had radio, 40 had air conditioning and power windows, 72 had air-conditioning and radio, 32 had radio and power windows, 24 had all three options and 16 had no option

Find the number of cars that had:

i) Only power option (1 mark)

ii) Only air conditioning (1 mark)

- iii) Only radio (1 mark)
- iv) Radio and power windows but not air- conditioning (2 marks)
- v) Air- conditioning and radio but not power windows (2 marks)
- vi) Only one of the option (2 marks)
- b) Solve the equation  $n-1C_2=28$  (4Marks)

c) . Solve the equation  $\tan^2 \theta = 2 \sin^2 \theta$  for the values of  $0 \leq \theta \leq 360^\circ$  (3marks)

d) Find the number of permutations of the following words

- i) MISSISSIPPI
- ii) CHEMMUTTUTT
- iii) ABRACADABRA (6Marks)

e) If the fourth term of an arithmetic sequence is 5 and the ninth term is 20, find the sixth term. (4 marks)

f) ) Let  $f(x) = x^2 - 3$  for  $x \geq 0$ . Find the inverse of the function f and show that  $(f \circ f^{-1})(x) = (f^{-1} \circ f)(x) = x$  (4 marks)

**QUESTION TWO (20MARKS)**

a) i) The  $n^{th}$  term of a sequence is given by  $2n+3$

- i) Write down the first four terms of the sequence. (2marks)
- ii) Find  $S_{50}$ , the sum of the first terms of the sequence. (2marks)
- iii) Show that the sum of the n terms of the sequence is given by  $S_n = n^2 + 4n$  (3marks)

b) Find  $(f \circ g)(x)$  for  $f(x) = x^2 + 1$  and  $g(x) = 3x - 2$  (3 Marks)

ii) In how many ways can a committee of four be formed from five boys and six girls if the committee must have at least a girl. (4 marks)

c) Solve the equation  $xP_2 = 6$  (2 marks)  
Simplify each of the following

- i)  $\tan^2 \theta \cos^2 \theta + \cot^2 \theta \sin^2 \theta$  (2 marks)
- ii)  $\tan \theta + \frac{\cos \theta}{1 + \sin \theta}$  (2marks)

**QUESTION THREE****(20 MARKS)**

a) A triangular plot ABC is such that  $AB = 36\text{m}$ ,  $BC = 40\text{m}$  and  $AC = 42\text{m}$   
Calculate the:

- (i) Area of the plot in square metres
- (ii) Acute angle between the edges AB and BC
- (iii) A water tap is to be installed inside the plot such that the tap is equidistant

from each of the vertices A, B and C. Calculate the distance of the tap . (5marks)

b) In a geometrical progression the sum of the second and third terms is 6 and sum third and fourth terms is -12. Find the first term and common ratio. (4 mks)

c) In how many ways can 7 people sit on a round table? (2 Marks)

d) Expand and simplify the Binomial expression  $\left(10 + \frac{2}{x}\right)^5$  hence use your expansion to find the value of  $14^5$  (5marks)

e) Solve the equation  $2\sin^2 x + 3\cos x - 3 = 0$  (4mks)

**QUESTION FOUR****(20 MARKS)**

a) Let  $f(x) = x^2 - 3$  for  $x \geq 0$ . Find the inverse of the function f and show that

$$(f \circ f^{-1})(x) = (f^{-1} \circ f)(x) = x \quad (3 \text{ marks})$$

b) i) Solve  $4 \tan^2 x + 2 \sec^2 x = 4$  (4mks)

ii) Simplify  $\tan \theta + \frac{\cos \theta}{1 + \sin \theta}$  (3marks)

c)

d) Expand  $(1 + 2x)^{20}$  up to the term  $x^5$  and evaluate  $(1.08)^{20}$  and  $(0.92)^{20}$  (6 Marks)

e) The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 10 find the common difference of the arithmetic progression. (4 marks)

**QUESTION FIVE****(20 MARKS)**

a) A committee of 10 members is to be chosen from 9 teachers and 6 students. In how many ways can this be done if:

i) The committee contains exactly 4 students (3marks)

ii) There is to be majority of teachers (2marks)

iii) There are at least 4 students (3marks)

iv) There are at most 7 teachers (3marks)

b) Two planes leave an airport at 12.00 noon. The first plane flies due west at a speed of 600km/hour and the second plane flies on a bearing  $N30^{\circ}E$  at a speed of 1000km/hour. Calculate how far apart the planes will be at 1.00pm and the bearing of the second from

the first at that time. (5 marks)

c) Expand  $(1 + x)^5$ , hence, use the expansion to estimate  $(1.04)^5$  correct to 4 decimal Places

(4marks)