QUESTION ONE (12 marks)

|  |
| --- |
|  |

1. Evaluate

.= 





 

QUESTION TWO (12 marks)

1.









|  |
| --- |
|  |

1.
2. 
3. 
4. The most likely outcome is 3 heads and 2 tails which has 0.3456 chance of occurring.

QUESTION THREE (12 marks)

1. 





 



1.



1. Show that the value of *A* is 220° C .



1. Find the value of *k* to 2 decimal places.



1.



QUESTION FOUR (12 marks)

1. Prove by mathematical induction that:

 for all 



There are 10 years of contributions, then 3 years without contributions, followed by a further 7 years of contribution. The first contribution occurred 20 years before the last.

Contributions occurred quarterly (80 quarters @ 1.5% per quarter)

First contribution= 

Second contribution=

Third contribution=

Last contribution before the 3 year break.= 

Therefore total contribution make for first 10 years is

1. Hence, calculate the total amount in the superannuation fund on retirement.

Total contribution = first 10 years contribution +Last 7 years contribution

=+



|  |
| --- |
|  |

1. Show that the value of *a* is 3 and that *b* is .





QUESTION FIVE (12 marks)

1. (i)



(ii) Express *x* as a function of *t.*





(iii) Hence, find the displacement when *t* = 2 seconds to 3 decimal places.

 

1. (i)



(ii)

=



1. Integrate both sides of the equation in part (ii).

=



1. Hence, or otherwise show:



 

QUESTION SIX (12 marks)

(i )

|  |
| --- |
|  |





(ii)



b)

1. Find an expression for 





|  |
| --- |
|  |



1. Show that the value of α occurs when $2<α<3.$



1. Take *x* = as the first approximation of α, use one application of Newton’s

method to find a second approximation for α correct to 3 decimal places.



QUESTION SEVEN (12 marks)

1. Show that *x* = *b* – *a* cos *nt* satisfies $\ddot{x}= -n^{2}(x-b)$.



1. Find the values of *a*, *b* and *n.*



1. Hence, find the earliest time before 3:40pm on this day, a boat may safely enter the

 harbour if the minimum depth of  metres of water is required.

 **



1. Show that the equation of the line *BL* is *y = – x.*



1. Find the time taken for the bullet to hit the ground at *L*.



1. Find the distance *BL* to the nearest metre.

**