**P425/2**

**APPLIED**

**MATHEMATICS**

**PAPER 2**

**Nov 2020**

**3HRS**

**ST. MARYS’ KITENDE**

**Uganda Advanced Certificate of Education**

**RESOURCEFUL MOCKEXAMINATIONS 2020**

**APPLIED MATHEMATICS**

**PAPER 2**

**3hours**

**Instructions to Candidates**

* *Answer* ***ALL*** *the eight questions in Section A and any* ***FIVE*** *from Section B.*
* *All necessary working must be shown clearly*
* *Mathematical tables with a list of formulae and squared papers are provided*
* *In numerical work, take g to be 9.8ms-2*
* *Include the allocation table on your answer sheet*
* *Draw double margins on each of the answer sheets / page to be used.*

**SECTION A (40MARKS)**

1. Two events and are such that and . Determine the; i)

ii) (5marks)

2. A particle of mass 2kg is acted upon by a force of magnitude 21N in the direction Find in vector form the;

i) Force

ii) acceleration hence its magnitude. (5marks)

3. A certain student from S.6 of a certain school recorded the following set of points.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | -2 | -1 | 0 | 1 | 2 |
|  | -5.5 | -3.0 | 1.2 | 3.4 | 6.0 |

Use linear interpolation or extrapolation to estimate;

i) when

ii) when (5marks)

4. A discrete random variable X has the probability distribution function given by;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 5 | 8 | 9 | 11 | 12 |
|  | ***a*** | 0.1 | ***a*** | 0.4 | 0.1 |

Where is a constant. Find the;

1. Value of
2. (5marks)

5. Car A is travelling at 35ms-1 along a straight horizontal road and accelerates uniformly at 0.4ms-2. At the same time, another car B moving at 44ms-1and accelerating uniformly at 0.5ms-2, B is 200m behind A, find the time taken before B overtakes Car A. (5marks)

6. Use the trapezium rule with five ordinates to estimate from to correct the value to 3 decimal places. (5marks)

7. The table below shows the time recorded in minutes when Aeroplanes pass through a point of observation at a certain city.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time | 50- | 60- | 70- | 80- | 90- | 100- | 110-120 |
| Frequency | 5 | 3 | 8 | 7 | 10 | 8 | 9 |

Calculate the;

1. median
2. number of Aeroplanes whose time exceed the median value. (5marks)

8. Forces of magnitude 20N, 12N and 30N act on a particle in the directions due South, east and N400E respectively. if the fourth force holds the particle in equilibrium; Determine the;

i) magnitude

ii) direction of the forth force. (5marks)

**SECTION B (60MARKS)**

*Answer any* ***five*** *questions in this Section.*

9. The probability density function of a random variable X is given by;

;

;

;

a) Sketch the function f(x) and show that the area =1.

b) Find the mean of x.

c) Determine the cumulative distribution function . (12marks)

10. a) Two ships A and B are observed from a coast guard station and have the following displacements velocities and times.

|  |  |  |  |
| --- | --- | --- | --- |
| **Ship** | **Displacement** | **Velocity** | **Time(t)** |
| A |  | -1 | 12:00hours |
| B |  | -1 | 13:00hours |

Find the time when the two are closest to each other.

b) If at 13:00hours ship A changed its velocity to , show that they collide and find the time and position of collision. (12marks)

11. a) show graphically that the equation has a root between estimate the initial approximation to 1 decimal place.

b) Using the above and the Newton Raphson method find the root correct it to 3 decimal places. (12marks)

12. The table below shows the speeds () in seconds and the number of errors() in the typed scripts of 12 secretaries of a certain institution.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Secretaries | A | B | C | D | E | F | G | H | I | J | K | L |
| Errors() | 12 | 24 | 20 | 10 | 32 | 30 | 28 | 15 | 18 | 40 | 27 | 35 |
| Speed() | 130 | 136 | 120 | 120 | 153 | 160 | 155 | 142 | 145 | 172 | 140 | 157 |

a) Construct a scatter diagram, draw the line of best fit and comment hence estimate x when .

b) Giving rank 1 to the fastest secretary and the secretary with the fewest errors calculate the rank correlation co-efficient and comment at 5% level of significance. (12marks)

13. A uniform lamina is in form of a square ABCD of side 2cm. E is a point on such that , if protion EDC is removed, find the expressions of the location of centre of gravity from AB and from AD, taking AB as the positive y-axis and AD as the positive x-axis. (12marks)

14. a) Given that the numbers x=4.2, y=16.02 and Z=25 are rounded off with corresponding percentage errors 0.5, 0.45 and 0.02 calculate the errors of x, y and Z.

b) Hence find the maximum value, the minimum value, absolute error, relative error and percentage error in . (12marks)

15. The speed of cars passing a certain point on a motorway can be taken to be normally distributed. Observations show that of cars passing the point, 95% are travelling at less than 85kmhr-1 and 10% are travelling at less than 55kmh-1. Determine the;

a) mean and standard deviation of the distribution.

b) proportion of cars that travel at more than 70kmhr-1 and the percentage it takes. (12marks)

16. A light inextensible string has one end attached to aceiling, the string passes under a smooth moveable pulley of mass 2kg and then over a smooth fixed pulley, the particle of mass 5kg is attached at the free end of the string, the sections of the strings not in contact with the pulleys are vertical, if the system is released from rest and moves in a vertical plane, determine the;

i) accelerations of the 2kg and 5kg masses

ii) tensions of the 2kg and 5kg masses.

iii) distance moved by the system in 1.5 seconds. (12marks)

**END**