

S475/1  
SUB- MATHS  
JUNE  
2 $\frac{2}{3}$  hours

UGANDA ADVANCED CERTIFICATE OF EDUCATION  
RESOURCEFUL MOCKS 2017  
SUBSIDIARY MATHEMATICS  
2 HOURS 40 MINUTES

**INSTRUCTIONS TO CANDIDATES:**

The paper consists of eight questions in section A and 6 questions in section B.

Answer *all questions* in section A and only *four* in section B.

Graph papers are provided

Silent non programmable calculators and mathematical tables with a list of formulae may be used.

**TURN OVER**

**SECTION A: (40 Marks)***Attempt all questions in this section.*

- Solve the equations;  
 $x + 2y = 7$   
 $x^2 - 4x + y^2 = 1$  (05 marks)
- Given that  $\frac{dy}{dx} = x^2 + kx$ , where  $k$  is a constant. If  $y$  has a turning point at the point  $(3, -2)$ , calculate the value of  
 (i)  $k$   
 (ii)  $y$  when  $x = 4$ . (05 marks)
- How many different committees consisting of two boys and three girls can be formed from a group of five boys and eight girls? (05 marks)
- Given that  $\mathbf{p} = 3\mathbf{a} - \mathbf{b}$  and  $\mathbf{q} = 2\mathbf{a} - 3\mathbf{b}$ , find the values of  $x$  and  $y$  such that  $x\mathbf{p} + y\mathbf{q} = \mathbf{a} + 9\mathbf{b}$ . (05 marks)
- The events  $A$  and  $B$  are independent. If  $P(A) = 0.3$  and  $P(B) = 0.5$ , find  
 (a)  $P(A \cup B)$  (03 marks)  
 (b)  $P(A \cap B')$  (02 marks)
- The discrete random variable  $X$  has the probability function shown in the table below.  

|            |     |     |     |     |     |
|------------|-----|-----|-----|-----|-----|
| $x$        | 1   | 2   | 3   | 4   | 5   |
| $P(X = x)$ | 0.2 | 0.3 | 0.3 | 0.1 | 0.1 |

 Calculate the;  
 (a) Expectation of  $X$  (02 marks)  
 (b) Variance of  $X$  (03 marks)
- If the random variable  $X$  is distributed as  $N(5, 4)$ , calculate the  $P(X > 0)$ . (05 marks)
- A stone is dropped from the top of a building of height 20m. Find the  
 (i) The time it takes to reach the ground (03 marks)  
 (ii) Velocity with which it hits the ground (02 marks)

**SECTION B: (60 marks)***Attempt only four questions in this section.*

9. (a) Factorise the expression  $4x^3 - 8x^2 - x + 2$ . (03 marks)
- (b) If the expression  $x^3 + px^2 + qx + r$  gives the same remainder when divided by  $x+1$  or  $x-2$ ,
- (i) show that  $p+q = -3$  (04 marks)
- (ii) If the remainder is 4 when divided by  $x-1$ , find the value of  $r$  (03 marks)
- (iii) Given that the remainder is -60 when the expression is divided by  $x+3$ , calculate the values of  $p$  and  $q$ . (05 marks)
10. (a) Solve the equation  $\tan 2x = 3 \cot x$ , for  $0^\circ \leq x \leq 360^\circ$ . (05 marks)
- (b) Angles  $A$  and  $B$  are both obtuse angles. Given that  $\sin A = \frac{5}{13}$  and  $\cos B = -\frac{3}{5}$ , find  $\tan(A-B)$ . (10 marks)
11. A spot check of the speeds of vehicles on a motorway are shown in the grouped frequency distribution table below.

| Speed(m.p.h)       | 56-58 | 59-61 | 62-64 | 65-67 | 68-70 | 71-73 | 74-76 |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Number of vehicles | 4     | 12    | 28    | 58    | 44    | 18    | 10    |

- (a) Calculate the
- (i) Mean speed
- (ii) Standard deviation
- (iii) Median speed (09 marks)
- (b) Plot an ogive for the above data. Use it to estimate the semi-interquartile range for the speeds of vehicles. (06 marks)
12. Below are the marks scored by 8 students A,B,C,D,E,F,G and H in statistics and mechanics tests in a given term.

|            | A  | B  | C  | D  | E  | F  | G  | H  |
|------------|----|----|----|----|----|----|----|----|
| Mechanics  | 35 | 40 | 60 | 54 | 63 | 40 | 55 | 72 |
| Statistics | 52 | 75 | 41 | 60 | 81 | 31 | 65 | 52 |

- (a) (i) Plot a scatter diagram for the data. Comment on the relationship between mechanics and statistics performance. (04 marks)
- (ii) Draw a line of best fit through the points of the scatter diagram. Use your result to estimate the marks in statistics for a student who got 47 in mechanics. (03 marks)
- (b) Calculate the rank correlation co-efficient for the two tests. Comment on your result. (08 marks)

13. (a) A bag contains 6 blue, 5 green and 4 red balls. Three balls are selected at random without replacement. Find the probability that ;
- (i) Two are blue and one is green. (04 marks)
- (ii) There is one of each color. (04 marks)

(b) The random variable  $X$  has a probability density function given by

$$f(x) = \begin{cases} kx(1-x^2); & 0 \leq x \leq 1 \\ 0 & , \text{ elsewhere} \end{cases}$$

Where  $k$  is a constant. Find the

- (i) Value of  $k$  (04 marks)
- (ii) Mean of  $X$  (03 marks)
14. (a) Five forces act as shown in figure 1 and are in equilibrium

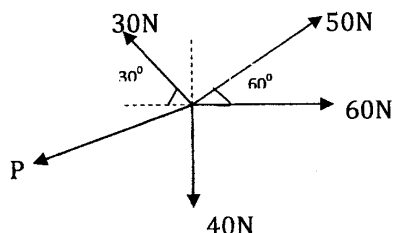


Figure 1

Find the magnitude and direction of force P

(08 marks)

(b) Figure 2 shows two particles A and B each of mass 0.5kg, joined by a light inelastic string which passes over a smooth fixed pulley at C.

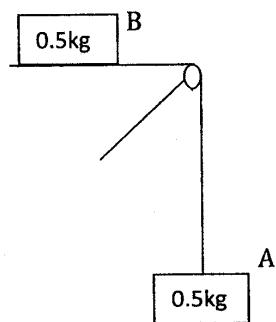


Figure 2

The system is held at rest with A hanging freely while B is on a rough horizontal surface. If the co-efficient of friction between B and the surface is 0.4, find the

- (i) The magnitude of the acceleration of each particle. (05 marks)
- (ii) The tension in the string when the system is released. (02 marks)

END