EXTERNAL MOCK EXAMINATION, 2015

APPLIED MATHEMATICS(P425/2)

Paper 2

INSTRUCTIONS:

1. *Attempt **all** the eight questions in section A and any **five** questions from section B.*
2. *In numerical work take g= 9.8m/s^2 .*
3. *Graph paper has been provided.*

*Attempt **all** questions in this section.*

1. Events A and B are such that P(A)=8/15, P(B)=1/3 and P(A/B)=1/5. Find the probability that ;

(i) at least one event occurs,

(ii) event B doesn't happen if event A has occurred. ***(05marks)***

2. The position vector of a particle of mass 2kg is given by **r** =6t^2 **i**-4t **j**-t^2 sin2t **k** metres. Find the speed after two seconds. ***(05marks)***

3. The table below shows the lost and gained scores in the two games A and B which were played on different days by Mary during the competitions at Lugogo stadium.

DAYS	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A	-4	5	-10	6	-3	-4	8
B	9	-5	11	-15	4	-5	-6

Calculate the rank correlation coefficient and comment on the result.

4.In a rectangle ABCD , AB=12cm and BC= 5cm. Forces of sizes 12N,18N, 27N and 15N act along the sides BA, BC, DC and DB respectively. The directions of the forces are shown by the order of the letters. Find the magnitude and direction of the resultant force. ***(05marks)***

5.The random variable Y has a probability distribution function P(Y=y)= $\left\{k\left(\frac{2}{3}\right)^y\right.$;y=0,1,2,,,,,,,,

Where k is a constant.

Find (i) k (ii) P($Y \leq 2$) ***(05marks)***

6.The table below is an extract from tables of tangents.

θ	$24'$	$30'$	$36'$	$42'$
Tan 25^0	0.4748	0.4770	0.4791	0.4813

Use linear interpolation or extrapolation to find

(i) Tan$25^0 18'$ (ii) $\tan^{-1} 0.4775$. ***(05marks)***

7. A bullet moving at a speed of 216km/hr penetrates 6cm into a fixed wooden rectangular block before coming to rest. Find the velocity of the bullet when it penetrates 5cm of the block. (05marks)

8. Use the graphical method to estimate the positive root of the equation $x=(2x-5)e^x$, correct to one decimal place. ***(05marks)***

SECTION B : (60MARKS)

*Do any **five** questions from this section. All questions carry equal marks.*

9. By the trapezium rule , use five strips to find the value of $\int_0^{\pi/2} x\cos x\, dx$, correct to three decimal places. Find the exact value of $\int_0^{\pi/2} x\cos x\, dx$, correct to three decimal places. Hence, find the percentage error made, correct to two decimal places. How would you improve on the degree of accuracy ? *(12marks)*

10. A light inextensible string of length 170cm is attached at its ends to two points at the same level 130cm apart. The string carries a mass of 2kg . A horizontal force is applied to the mass causing the angle between the two sections of the string to be a right angle. Find the size of the horizontal force and the tension in the string. (g= 10m/s^2) *(12marks)*

11. A Hardware shop at Kasangati trading centre sells Sadolin paint in Jerricans of mean volume 20litres and a variance of 1.44. Given that the volume of any jerrican are normally distributed, find the

(a) probability that the volume of jerrican picked at random will lie between 17.0 and 21.0 litres of paint.

(b)percentage of the jerricans whose volume exceeds 22.0 litres**.** **(***12marks***)**

12,(a)A body of mass 3kg initially at rest is acted upon by three forces $\mathbf{F}_1$=(**i**-**j**+2 **k**)N, $\mathbf{F}_2$=(2 **i**+3 **j**+2 **k**) N and $\mathbf{F}_3$= (4 **j**-**k**)N. Find the work done by the forces in a time of three seconds.

(b) A tractor of mass moves from rest down a slope of a certain inclination by a tractive force of 7500N. The resistance to its motion being 720N.

(i) Calculate the gained kinetic energy.

(ii) Given that the tractor gains speed of 40m/s in 15seconds, calculate the slope of inclination. (*12marks*)

13.(a)Two tetrahedral dice , both numbered 1 to 4 are tossed. If one die is fair and the other is biased such that a four is twice as likely as any other score, find the probability that a total of four is obtained.

(b)A bag contains 2red, 3yellow and 4black balls. Three balls are selected at random without replacement. Find the probability that the (i) first ball is red and the second ball is black,

(ii) third ball is black when the first is red and the second is black. (*12marks*)

14.The table below shows the blood pressure of the senior students a certain college.

Blood pressure	95-	105-	110-	115	120-	125-	130-	140-150
Frequency	2	5	6	9	14	3	6	5

(a) Calculate the (i) mean blood pressure ,

(ii) Number of students whose blood pressure is less than the mean blood pressure.

(b) Draw an ogive and estimate the lower and upper quartile blood pressure.

15. Two trains A and B moving along straight level railway lines have velocities 26km/hr on a bearing 225^0 and 24km/hr on a bearing 240^0 respectively. If A is initially 341 metres from B on a bearing of 339.4^0 and the trains do not alter their velocities,

(a) show that the trains are involved in an accident,

(b) find the distance travelled by each train just before the accident. (*12marks*)

16. Given that a and b are the numbers estimated with errors E_1 and E_2 respectively, show that the maximum relative error in $\frac{a}{b}$ is $\left|\frac{E_a}{a}\right|+\left|\frac{E_1}{b}\right|$.

Given that the numbers p= 3.7 and q= 70 are each rounded off to the percentage errors 0.2% and 0.05% respectively, find the relative errors in $\frac{q}{p}$, correct to two significant figures . (*12marks*)

END