P425/2 APPLIED MATHEMATICS
PAPER 2

Answer *all* questions
In numerical work take g = 9**.**8ms^{-2}

SECTION A (40 MARKS)

1. Two events A and B are such that P(A) = $^1/_3$, P(B) = ½ and P(A'∩B) = ½
   Find the
   (i) relationship between A and B
   (ii) P(A'∩B') (5 marks)

2. Find the range of 4^x when the measured value of x = 2**.**4 (1 d.p) (5 marks)

3. The probability that a fisherman catches a fish is $\dfrac{7}{10}$ on a cloudy day and $\dfrac{1}{5}$ on a clear day. If

   the probability of a cloudy day is $\dfrac{3}{5}$, find the probability that the day was cloudy given that he

   did not catch a fish (5 marks)

4. Two light inextensible strings have one end fixed to a common point, C , on the ceiling and the other ends tied to the ends of a uniform beam AB of mass 10kg and length 2L. If both strings make an angle of 30° with the beam, and keep it in equilibrium when the beam is horizontal. Find the tension in the strings. (5 marks)

5. The distance between Gayaza and Kampala city is 16 km. In between are three trading centres where a bus can stop. The trading centres are 6km, 7km and 13 km respectively from Gayaza and the charges are also respectively 500/=, 800/= and 1,000/= being charged from Gayaza town. If John visited his friend Sarah living 11km from Gayaza, find how much he was charged and suppose he had only 950/= and the bus leaves him at a distance worth his money, find how far from Kampala the bus leaves him.

   (5 marks)

6. A particle of mass 2kg, is moving with velocity (5**i** – 3**j**) ms^{-1} when it receives a force of (– 2**i** – 4**j**) N. It this force acts for 4 s, find the new velocity and the distance of the particle from the origin after this time.

   (5 marks)

7. Eight applicants for a certain job obtained the following marks in oral and written tests.

Applicant	A	B	C	D	E	F	G	H
Oral test	15	20	28	12	40	60	20	80
Written test	40	30	50	30	20	10	30	60

Calculate a rank correlation coefficient of the applicants' performance in the two tests. Comment on your result.

8. Use the trapezium rule with 6 ordinates to estimate

$$\int_{0}^{1} \frac{dx}{\sqrt{3-2x}}$$, correct to 3 decimal places. (5 marks)

SECTION B: (12 marks each)

9. (a) Given the numbers x = 4.32 and y = 2.265 all measured to the nearest decimal places. Find the maximum possible percentage error in $x^2 + y$.

(b) Given the table below;

x	0.1	0.2	0.3	0.4
$\sqrt{x}$	0.3162	0.4472	0.5477	0.6325

Use linear interpolation /Extrapolation to estimate

(i) $\sqrt{0.25}$ (ii) $\sqrt{x} = 0.75$; find the percentage error in each case.

10. At a certain fuel station, 30% of the customers buy SUPER(S), 60% buy REGULAR (R) and the remainder DIESEL (D). Of those who buy S, 25% fill the tank, 80% do not fill the tank with D, 70% fill their tank with (R).
(i)   Find the probability that when a vehicle leaves the station, it does not have a full tank.
(ii)   Given that a vehicle has a full tank, determine the probability that the tank contains regular fuel.

11. The table below shows the marks that were scored by 400 candidates who attended a mathematics contest and the maximum mark was 99.

Marks	No of candidates
0 – 9	10
10 – 19	26
20 – 29	42
30 – 39	66
40 – 49	83
50 – 59	71
60 – 69	52
70 – 79	30
80 – 89	14
90 – 99	6

(a) Calculate the mean and modal mark of the candidates

(b) (i) Construct a cumulative frequency curve and use your curve to estimate the median and the 20th percentile.
(ii) If the minimum mark for Grade A was fixed at 74, estimate from your curve the percentage of candidates obtaining Grade A.

12. A particle of mass 3 kg is acted upon an time t by a force F where F= $6i - 36t^2j + 54$ tk. At time t = 0 the particle is at the point with position vector $i - 5j - k$ and its velocity is $3(i + j)$. Find the position vector of the particle at time t = 1.

13. In a survey on the smoking habits of a certain community of adults, it was found that ¾ of the community were smokers and ¼ non-smokers. Of the smokers, 2/3 were male while 40% of the non-smokers were female. Of the men 20% were unemployed and so were ½ of the women; being unemployed was independent of whether they smoked or not. Find the probability that;

   (a)   a person chosen at random is a female smoker.
   (b)   A female chosen at random us a female
   (c) A female chosen at random is a smoker
   (d)   A smoker chosen at random is an unemployed.

14. a) Show that $x^4 + x^2 - 80 = 0$ has a root near x = 3. By taking x = 3 as the first approximation, use Newton's method twice to obtain a better approximation.

   b) Show that x = 2 sin x has a solution between 1.8 and 2 and use linear interpolation to find a closer solution to 2 decimal places.