P425/2

Mathematics

Paper 2

2 hours and 30 minutes.

M.S.S. S.6 PRE-MOCK EXAMINATIONS 2024

MATHS PAPER2

Time: 2 ½ hours.

Instructions to candidates.

- Answer all questions in section A and do only 5 questions from section B. any additional qn(s) shall not be marked.
- All necessary working must clearly be shown.
- Start each number on fresh page of the paper.
- Mathematical tables may be used.

SECTION A.

1. Two events a and b are such that $P(A/B) = 2/5$, $P(B)=1/4$ and $P(A) = 1/5$. find
   (a) $P(AnB)$ 2mks
   (b) $P(AuB)$ 3mks

2. The heights (cm) and ages (years) of a Radom sample of tem farmers are given in the table below.

Height (cm)	156	151	152	160	146	157	149	142	158	140
Age (yrs)	47	38	44	55	46	49	45	30	45	30

   Calculate rank correlations coefficient and comment on your results. 5mks

3. find the approximate value to 1dp of
   $\int_0^1 \frac{dx}{1-x}$ Using trapezium rule with five strips. 5mks

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4. A stone is thrown vertically upwards with velocity of 21ms-1, calculate the;
   (i)   maximum height attained by stone. 3mks
   (ii)   time the stone takes to reach maximum height. 2mks

5. A discrete radom variable x has the following p.d.f.

X	0	1	2	3	4	5
P(X=X)	0.11	0.17	0.2	0.13	P	0.09

$$\Sigma x^2 - (\Sigma x)^2$$

   Find the; (a) value of P.   2mks
            (b) expected value of x.   3mks

6. A particle of mass 2kg moves under the action of three F1, F2 and F3 at a
   time Ti F1=1/4(t-1) + (t-3) jN, F2=(1/2+2) I + (1/2t-4) jN and F3=(1/4t-4)
   if(3/2t+1)jN, Find the acceleration of the particle when t=2 seconds.

7. The table below shows how T varies with S.

T	-2.9	-0.1	2.9	3.1
S	30	20	12	9

   Use linear interpolation extrapolation to estimate the value of

   (a) T when S=26
   (b) S when T=3.4

8. Forces of 7N and 4N act away from a common point make an angle of
   $\theta°$ with each other. given that the magnitude of their resultant is 10.75N,
   find the
   (i)   value of θ
   (ii)   Direction of the resultant.

SECTION B.

9. A uniform beam AC of mass 8kg and length 8m is hinged at A and is
   maintained in equilibrium by two strings attached to it at points C and D as
   shown below. The tension in BC is twice that of BD. $\overline{AB}$ =4m, $\overline{AD}$ = ¾ $\overline{AC}$.
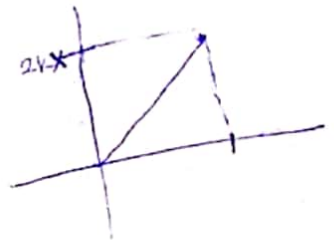   Find (i) tension in string BC
   (ii) Magnitude and direction of the resultant
   force acting on the hinge. (12mks)

$$R^2 = F_1 + F_2 \quad F_1 F_2 \cos\theta$$

10. A continuous radom variable X has a p.d.f given by

$$f(x) = \begin{cases} 2kx & ; \ 0 \leq x \leq 1 \\ k(3 - x) & ; \ 1 \leq x \leq 2 \\ 0 & ; \ elsewhere \end{cases}$$

(a) Sketch the functions f(x)

(b) Find (i) value of K

    (ii) Mean of x

    (iii) $P1 < x < 2/x > 10$)

11. The table below shows the marks obtained by 100 students in a mathematics test.

Marks	20-<40	40-<50	50-<55	55-<60	60-<70	70-<90	90-<100
Number of students	5	15	10	15	25	25	5

5mks

(a) Calculate the mean mark.

(b) Draw a cumulative frequency curve and use it to find the

    (i) median mark.

    (ii) range of the middle 40% of the marks.

12. By plotting graphs of $y = x$ and $y = 4sinx$ on the same axes, show that the roots of the equation $x - 4sinx = 0$ lies between 2 and 3. Hence use Newton Raphson's method to find the root of the equation correct to 3dps.

12mks

13. At 11:45am, ship A has a position vector (si =j)km and moving at 8kmh in the direction N30°E.At 12 noon another ship B has a position vector (8i+7j) km and moving at 3kmh-1 in the direction south East.

(a) Find the position vector of ship A at 12 noon. 3mks

(b) if ships after 12 noon maintain their courses, find the;

    (i)   Time when they are closest.   9mks.

    (ii)   Least distance between them.

14. A particle of weight 24N is suspended by a light inextensible string from a light ring. The ring can slide a long a rought horizontal road. The coefficient of friction between the rod and the ring is 1/3. A force of P Newton's acting

upwards on particle at 45o to horizontal, keeps the system in equilibrium with the ring at a point of sliding. Find (i) value of P.

(ii) Tension in the string.   12mks

15. (a) The numbers x and y are approximated by x and y with error $\left|\frac{\Delta x}{y}\right| + \left|\frac{\Delta y}{x}\right|$

5mks

(b) If $x=4.95$ and $y=2.013$ are each rounded off to the given number of d.p, calculate;

(i)   Percentage error in xy.

(ii)   Limits within which xy is expected to lie. Give your answer to 3 d.p2.

7mks

16. a pair of dice is tossed 180 times, determine the probability that the sum of 7 appears;

(a) Exactly 40 times.

(b) between 25 and 35 inclusive times.   12mks

END