U.A.C.E ASSESSMENT EXAMINATIONS TERM II, 2017,

APPLIED MATHEMATICS PAPER TWO, P425/2,

Time: 3hrs

Instructions: Attempt all the ***eight*** questions in section A and any ***five*** from section B.

Where necessary, acceleration due to gravity g = $9.8ms^{-2}$

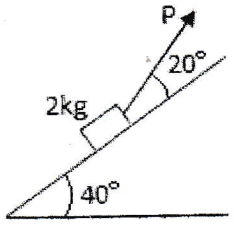
Any ***extra question(s)*** attempted ***will not*** be marked.

Section A

1. Given that $P(B/A) = \frac{1}{3}$, $P(B/A') = \frac{5}{8}$, $P(A' \cap B') = \frac{3}{20}$. Find:
   i. $P(A \cap B')$, ii. $P(A/B)$.
2. A rectangle has sides given by, l = 12.61 and b = 10.4. If the dimensions are rounded, find the percentage error in calculating the area of the rectangle.
3. A particle is projected vertically upwards with a speed of $28ms^{-1}$. Find:
   i. the height at which the speed is $10ms^{-1}$,
   ii. the time taken to reach the maximum height.
4. The table below shows the values of quantities x and y.

x	51	62	64	47	54	44	52	68	61	56
y	45	54	58	46	49	43	48	59	56	53

   Calculate the rank correlation coefficient and comment on your result.
5. A particle of mass 2kg is prevented from sliding down a rough plane by a force P act as shown below:



   If the coefficient of friction between the surfaces is 0.27, find the value of P.
6. 25% of the eggs supplied by a farmer are cracked. If 80 eggs are delivered, find probability of getting between 20 to 30 cracked eggs.
7. The table below shows the rate of cooling of the temperature of an object:

t(s)	0	10	20	30	40

T(^{0}C)	80	73.6	69.4	60.8	55.2

Find: i. the value of T when t = 26.7s, ii. the value of t when T = 51.3^{0}C.

8. A particle P initially located at point (-10,11) is travelling with a constant velocity of $4\mathbf{i} - 3\mathbf{j}$. Two seconds later a particle Q is located at point (6,-3) and is travelling with a constant velocity of $2\mathbf{i} - \mathbf{j}$. Show that if the particles maintain their velocities, collision will occur. Hence determine how long particle P takes to reach the point of collision.

Section B

9. The table below shows the marks scored in a mathematics test by some students:

Marks	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
frequency	3	2	5	8	15	17	13	7	6	4

a. Calculate: i. the standard deviation, ii. the mode,

b. Construct an ogive and use it to obtain the 77th percentile.

10.a. A car of mass 500kg moving with a speed of 72kmh^{-1} collides with a stationary car of mass 700kg. If the two cars coalesce after collision and continue to move in the same straight line as the first car , find the loss in kinetic energy due to the collision.

b. A gun of mass 2000kg fires a shell of mass 3kg in a horizontal direction. If the gun recoils on rough ground through a distance of 5m before coming to rest find the muzzle velocity of the shell given that the coefficient of friction between the surfaces is 0.125.

11.a. A discrete random variable has a probability mass function given in the table below:

x	1	2	3	4	5
P(X = x)	0.1	0.3	a	0.2	0.05

Find: i. the value of a, ii. the expectation of X.

b. A random variable X has a probability density function given by:

$$f(x) = \begin{cases} \frac{3}{32}x^2, & 0 \le x \le 2 \\ \frac{3}{32}(6-x), & 2 \le x \le 6. \\ 0, & elsewhere \end{cases}$$

Find $P(1.5 < X < 3.8)$ to four decimal places.

12. Using trapezium rule with six ordinates, evaluate $\int_0^1 cos2xdx$ correct to three decimal places. Hence determine the percentage error incurred in the approximation above.

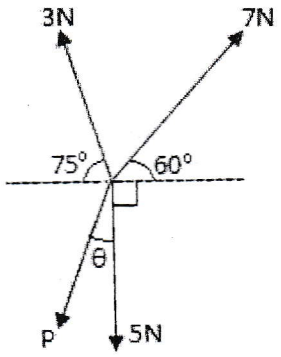
13.a. A random variable X has a mean of 1000 and a variance of 22500.

Find: i. P(751< X < 1289), ii. P(X > 917.65).

b. The masses of canned beef from a production line is normally distributed with a mean μ and variance 18g. A random sample of 25 is found to have a mean of 455g. Obtain the 99% confidence interval for the mean mass of a can produced by the factory.

14.a. A rectangle ABCD has side AB = 10cm and angle CAB = 20^0. Forces of 5N, 5N, 5N, 10N and 20N act along the sides in the directions BA, CD, DA, CA and DB respectively.
Find: i. the magnitude and direction of their resultant,
ii. where the equation of its line of action cuts the side AB from vertex A.

b. The forces below are in equilibrium:



Obtain the values of P and θ.

15.a. Show that the equation $xe^{-x} = 2x - 5$ has a root between x = 2 and x = 3.

b. i. Obtain the simplified Newton- Raphson's iterative formula for finding the root of the above equation.

ii. Use the above equation to calculate the root correct to three decimal places.

16.a. A particle covers 10m in the third second and 15m in the fourth second, find the acceleration of the particle and its initial velocity.

b. Two points P and Q are 120m apart. The speed of a cyclist increases by $6ms^{-1}$ from P to Q. If she is accelerating at $0.6ms^{-2}$, find:

i. the speed of the cyclist at P,

ii. the time she takes to move from P to Q.