**BUTIRU CHRISTIAN COMPREHENSIVE SECONDARY SCHOOL**

**Uganda advanced certificate of education**

**APPLIED MATHEMATICS SEMINAR**

**PRESENTATION ON 7TH/JULLY/2024**

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| **APPLIED MATHEMATICS (P425/2) COURSE OUTLINE** | | |
| S/N | TOPIC | SUB-TOPICS |
| 1 | Mechanics (6 questions) | * Linear motion and Projectiles * Force and Newton’s laws of motion * Linear momentum * Composition and Resolution of forces * Friction and Moments * Work, Energy and Power * Elasticity * Circular motion and Simple Harmonic Motion * Vector mechanics * Coplanar forces and Jointed rods * Centre of gravity |
| 2 | Numerical analysis (4 questions) | * Location of the roots of an equation * Trapezium rule of numerical intergration * Newton Raphson Method(NRM) * Errors and Flow charts |
| 3 | Statitics and probability (6 questions) | * Descriprive statistics * Index numbers * Scatter graphs and Rank Correlations * Discrete probability distributions * Continous probability distributions * Distributions (i). Uniform distribution   (ii). Normal distribution  (iii). Binomial distribution  (iv). Normal approximation to binomial distribution   * Estimations |

**QUESTIONS**

**STATISTICS AND PROBABILITY**

1a). Two events A and B are such that P(A)= and P(B)= , find the probability of A or B if A and B are;

(i) mutually exclusive (ii) independent

b). Three events A, B and C are defined in a sample space. The events A and C are mutually exclusive. The events A and B are independent. Given that (𝐴) = , 𝑃(𝐶) = 𝑎𝑛𝑑 𝑃(𝐵) = 2 3 .

Find; (i) P(AUC) (ii) P(B) (iii) P(AnB)

c). A bag contains 5 white, 3 red and 2green counters. 3 counters are drawn without replacement. Determine the probability, there ; (i) is no green counter (ii) are no white counters and a green counter

2.a)A box contains 8 red, 3 white and 9 blue balls. If three balls are drawn at random (without replacement) in succession, determine the probability that ; (i) All the three are red (ii) all the three are white (iii) all the three are blue. (iv) The draws are in order, red, white, blue, (v) all the three are of different colours (vi) Two red and one white (vii) Atleast two whites

b). When a car owner needs her car serviced. She phones one of the three garages, A ,B OR C. Of the calls she made, 30% are to garage,A, 10% to B and 60% to c. The percentages of occasions when the garage phoned can take the car in on the day of phoning are 20% for A, 6% for B and 9% for c. (i) Find the probability that the garage phoned will not be able to take the car in on the day of phoning. (ii) Given that the car owner phones a garage and the garage can take her can in on that day, find the probability that she phoned garage B.

3. Two boxes P and Q contain white and brown cards. P contains 6 white cards and 4 brown cards. Q contains 2 white cards and 3 brown cards. A box is selected at random and a card is selected. Find the probability that;

(i) a brown card is selected

(ii) box Q is selected given that the card is white.

4. When three marksmen take part in shooting contest, their chance of hitting a target are; 1 2 , 1 3 𝑎𝑛𝑑 1 4

(a) Calculate the chance that one and only one bullet will hit the target if all men shoot simultaneously.

b) Determine the probability that the target will be hit. (Assume independence)

5. a) Two independent events A and B are such that P(A)=0.40, P(B)=a, P(AUB)=07.0. Find;

(i) (ii) the value of a (iii) P(AnB) (iv) P(AnB1).

b). . X is a random variable, “the member of likely boys obtained” for the family that plans to have three children. Find E(x).

**MECHANICS**

10a)A motor car, starting from rest and moving with uniform acceleration, goes 9.5 𝑚 in the 10𝑡ℎ second after starting. Find the acceleration of the car, and the distance covered during 5 𝑠 from the start.

b). Two particles, 𝑋 and 𝑌, are moving in the same direction on parallel horizontal tracks. At a certain point 𝑂, the particle 𝑋, travelling with a speed of 16 ms−1 and retarding uniformly at 6 ms−2, overtakes 𝑌, which is travelling at 8 ms−1 and accelerating uniformly at 2 ms−2. Calculate (a) the distance of 𝑌 from 𝑂 when the velocities of 𝑋 and 𝑌 are equal (b) the velocity of 𝑋 when 𝑌 overtakes 𝑋

11. A car is moving along a straight horizontal road at constant speed 18 ms−1. At the instant when the car passes a lay-by, a motor-cyclist leaves the lay-by, starting from rest and moves with constant acceleration 2.5 ms−2 in pursuit of the car. Given that the motorcyclist overtakes the car 𝑇 seconds after leaving the lay-by, calculate (a) the value of 𝑇 (b) the speed of the motor-cyclist at the instant of passing the car

12.a) A projectile is fired horizontally from the top of the cliff 250 m high. The projectile lands 1.414 × 103𝑚 from the bottom of the cliff. Find the (i) initial speed of the projectile (ii) velocity of the projectile just before it hits the ground

b). An object A is projected upwards from a height 60 𝑚 above the ground with a velocity of 20 ms-1 at 300 to the horizontal. At the same time, another object B is projected from the ground upwards towards A at 300 to the horizontal. A and B collide at height of 60 m above the horizontal ground, when they are both moving downwards, Find the

(i) the speed of projection of B

(ii) the horizontal distance between the points of projection

13 a). The action of the following three forces on a body results in equilibrium: (−9i + j − 7k) 𝑁, (3i + 10k) 𝑁 and (𝑎i + 𝑏j + ck) 𝑁.

(i) What are the values of 𝑎, 𝑏 and 𝑐?

(ii) Calculate the magnitude of (𝑎i + 𝑏j + ck) 𝑁 21.

b). The tensions in four telephone wires attached to a telegraph post are (17i − 9j) 𝑁, (−11i + 6j) 𝑁, (−3i − 18j) 𝑁 and (𝑎i + 𝑏j) 𝑁. The four forces are in equilibrium.

(a) Find the values of 𝑎 and 𝑏

(b) Calculate the magnitude of (𝑎i + 𝑏j) 𝑁

14. (a). A train stops at two stations P and Q, which are 2 km apart. It accelerates uniformly from P at for 15seconds, and maintains a constant speed for a time before decelerating uniformly to rest at Q. If the deceleration is . Find the time for which the train is travelling at a constant speed.

b). A bus travelling steadily at 30 along a straight road passes a stationary car which 5 s later begins to move with uniform acceleration of in the same direction as the bus.

(a) How long does it take the car to acquire the same speed as bus?

(b) How far has the car travelled when it is level with the bus?

15(a)(i). A ball is thrown vertically upwards with a speed of , from a point which is 0.7 m above the ground. Find the speed with which the ball hits the ground, and the time taken.

(ii). The pilot of an aero plane flying horizontally at a height of 200m with a constant speed of 540 wishes to hit a target on the ground. At what distance from the target should the pilot release the bomb to hit the target?

b). ABCDEF is a regular hexagon of side 2m. forces of 2N, 3N, 4N and 5N acts along AC, AE ,AF and ED respectively. Find the single force equivalent to this system and find where its line of action cuts AB.

**END**

**‘’Giving up is not an option’’**