

**HOLIDAY ASSESSMENTS**  
**S.6 APPLIED MATHEMATICS**  
**TIME : 3 HOURS**

**SECTION A (40 MARKS)**

*Attempt all questions in this section*

- Two events A and B are such that  $P(A) = 0.7$ ,  $P(A \cap B) = P(A \cup B) = 0.2$ . Find;  
 (a)  $P(A)$   
 (b)  $P(A/B)$
- Forces of magnitude 4N, 3N, 6N, 5N and 8N act along the lines AB, BC, CD, DA and AC respectively of a square ABCD. The direction of the forces are indicated by the order of the letters. Find the magnitude and direction of the resultant force.
- Use the trapezium rule with six coordinates to evaluate  $\int_0^{\pi/3} e^x \cos x \, dx$ ; correct to 3 decimal places.
- Given that  $A = \frac{1}{2} bc \sin \theta$ . Find the maximum error in A if;  
 $b = 4.25$ ,  $C = 7.2$  and  $\theta = 121^\circ$ .
- The table below shows the expenditure in (Ush) of a student in 2009 and 2010.

Item	Expenditure		Weight
	2009	2010	
Eats	50,000	80,000	8
Airtime	10,000	30,000	2
Pocket money	45,000	100,000	5
Scholastics	51,000	90,000	10
Club T-shirts	10,000	25,000	1

Using 2009 as the base year, calculate the average weighted price index correct to two decimal places.

- Two events are neither independent nor mutually exclusive such that  $P(A) = \frac{1}{3}$ ,  $P(B) = \frac{2}{9}$ ,  $P(A/B) = 0.5$   
 Find:  
 (I)  $P(A \cap B)$   
 (II)  $P(B/A)$
- Show graphically that the equation  $x^3 - 2x - 5 = 0$  has one real root. State the root of this equation correct to one decimal place.
- Given the mean, median and standard deviation of the following values  
 $2, 4, 6, 3, 1, 2, 1, 1, 5, 4, 2, 5, 6, 8, 15, 7$

**SECTION B (60 MARKS)**

*Answer any five questions in this section. All questions carry equal marks.*

- The probability density function f a continuous random variable x is given by;  

$$f(x) = \begin{cases} kx(1-x^2); & 0 \leq x \leq 1 \\ 0 & ; \text{otherwise} \end{cases}$$
 Find the;  
 (a) Value of K.  
 (b) Mode for distribution  
 (c) Cumulative distribution function and use it to determine;  
 (i) The standard deviation  
 (ii)  $P(0.1 \leq x \leq 0.6)$
- (a) Abel, Bob and Charles applied for the same job in a certain company. The probability that Abel will take the job is  $\frac{3}{4}$ . The probability that Bob will take it is  $\frac{1}{2}$ , while the probability that Charles won't take it is  $\frac{1}{3}$ .  
 What is the probability that;  
 (i) none of them takes the job?  
 (ii) one of them will take the job?  
 (b) Two events A and B are independent. Give that  $P(A \cap B) = \frac{1}{4}$  and  $P(A/B) = \frac{1}{6}$  find  
 (i)  $P(A)$   
 (ii)  $P(B)$   
 (iii)  $P(A \cap B)$   
 (iv)  $P(A \cup B)$
- (a) Show that the Newton Raphson's iterative formula for finding the natural

logarithm of a number N is given by;

$$X_{n+1} = \frac{e^{x_n}(x_n - 1) + N}{e^{x_n}} \text{ for } n = 0, 1, 2, \dots$$

- (b) Draw a flow chart that reads the initial approximation  $X_0$  and N computes and prints N and its logarithm after three iterations and gives the logarithm correct to three decimal places. Hence perform a dry run for  $1 \leq n \leq 14$  taking  $X_0 = 2.5$ .

12. The table below shows the distribution of the heights of S.6 students in a certain school to the nearest cm.

Height (cm)	Number of students
150 –	3
155 –	7
160 –	10
165 –	15
170 –	25
175 –	12
180 –	6
185 – 190	2

- (a) Calculate;
- Mean
  - Median
  - Standard deviation
- (b) Plot a cumulative frequency curve for the data above and use it to estimate;
- The range of the heights in the middle 60% of the distribution.
  - The quartile range.

13. (a) Three students A, B, and C aim at a particular target the probability that A hits the target is  $\frac{2}{3}$  and the corresponding probabilities for B and C are  $\frac{5}{6}$  and  $\frac{3}{4}$  respectively. Find the probability that the target is nil.

- (b) Discrete random variable X has a probability function given by;

$$f(x) = \begin{cases} \alpha x + \beta & ; \quad 1 \leq x \leq 2 \\ \alpha x + \beta & ; \quad x = 3 \\ 0 & ; \quad \text{elsewhere} \end{cases}$$

- The values of  $\alpha$  and  $\beta$ .
- The most likely value of X.
- $P(-1 \leq x \leq 2 / x \geq 1)$

14. (a) The table below shows values of a standard normal variable Z and their corresponding probabilities.

Z	1.852	1.960	2.014	2.441
I(Z)	0.4860	0.4750	0.4780	0.4927

- $I(2.521)$  correct to 4 decimal places.
  - $I^{-1}(0.4661)$  correct to 3 decimal places.
- (b) Show graphically that the equation  $4 \tan x + 4 - 4 = 0$  has two roots in the interval  $-\frac{\pi}{2}$  and  $\frac{3\pi}{2}$ . Hence state the roots.

**END**