SECTION B (60 MARKS)

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

9. The heights (in cm) of **100** recruits who reported for a recruitment exercise were recorded as follows:

Height (cm)	Number of recruits
150 – 155	5
155 – 160	13
160 – 165	24
165 – 170	22
170 – 175	19
175 – 180	11
180 – 185	1
185 – 195	5

(a) Calculate the;

(i) Mean height

(ii) Standard deviation of the height *(07 marks)*

(b) Draw a histogram and use it to determine the modal height of the distribution *(05 marks)*

10. (a) By plotting the graphs of $y = x^3$ and $y = 2x + 1$, show that the equation $x^3 - 2x - 1 = 0$ has a root between **1** and **2**. Estimate the first approximation; x_r from your graph, correct to **two** decimal places. *(05 marks)*

(b) Show that the two general iterative formulae for solving the above equation can be expressed as;

$$x_{n+1} = \frac{1}{2}(x_n{}^3 - 1); n = 0, 1, 2, \ldots\ldots I$$

$$x_{n+1} = \sqrt{\left(2 + \frac{1}{x_n}\right)}; n = 0, 1, 2, \ldots\ldots II$$ *(04 marks)*

(c) Using x_r obtained in (a) above and each formula **twice**, decide on the best formula, giving a reason for your decision and the root, correct to **two** decimal places. *(03 marks)*

150 – 155

156 – 161 25.

11. (a) A body is projected vertically upwards with velocity of $21\ ms^{-1}$. Determine the time it takes to reach a point $280\ m$ below the point of projection

(b) A particle projected with a speed of $12\ ms^{-1}$ to move in a straight line on a rough horizontal surface comes to rest in **5** seconds. Calculate the distance it covers in its **last second** of motion. *(12 marks)*

12. An industry manufactures iron sheets of mean length $3.0\ m$ and standard deviation of $0.05\ m$. Given that the lengths are normally distributed, find;

(a) Probability that the length of any iron sheet picked at random will be between $2.95\ m$ and $3.15\ m$ *(05 marks)*

(b) Middle **70%** range of the length of the iron sheets *(05 marks)*

13. (a) The table below shows corresponding values of x and y for $y = x\ lnx$.

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	0.000	0.608			3.296	4.385	5.545

(i) Copy and complete the table with the values of y corresponding to $x = 2.0$ and $x = 2.5$, giving your answer to **three** decimal places. *(02 marks)*

(ii) Use the trapezium rule with all the values of y in the completed table, to obtain an estimate for $\int_{1.0}^{4.0} (x\ lnx)dx$, giving your answer correct to **two** decimal places. *(04 marks)*

(b) (i) Tabulate the values of the function $y = 3\cos\left(\frac{x}{3}\right)$ for the interval $0\left[\frac{3\pi}{8}\right]\frac{3\pi}{2}$, correct to **four** significant figures.

(ii) Using the above table and of scales of $2\ cm : 0.5\ units$ on $y - axis$ and $4\ cm : \frac{3\pi}{8}\ units$ on $x - axis$, draw a graph of $y = 3\cos\left(\frac{x}{3}\right)$.

(iii) By dividing the area under the graph between the lines $x = 0$ and $x = \frac{3\pi}{2}$ into trapezia of equal strip width of $\frac{3\pi}{8}$, estimate the total area under the graph, correct to **three** significant figures.

(06 marks)