

INTERIM JOINT MATRICULATION BOARD
AHMADU BELLO UNIVERSITY
ZARIA



INTERIM JOINT MATRICULATION BOARD EXAMINATION 2016

SUBJECT: 'A' LEVEL MATHEMATICS PAPER III
DATE SCHEDULED: THURSDAY 18TH FEBRUARY, 2016
TIME ALLOWED: TWO HOURS (2 HRS)

Instructions:

- (i) Unless otherwise restricted, the use of mathematical tables is PERMITTED.
- (ii) Use of SCIENTIFIC calculator is ALLOWED.
- (iii) Marks for each question are indicated at the end.
- (iv) Do not spend more than HALF (1/2) HOUR on section A.
- (v) Attempt ALL questions in section A; and FOUR (4) questions from other sections, choosing at least ONE (1) question from each of sections B and C.

SECTION A (20%)

1. Find the equation of a straight line which passes through the point of intersection of the lines $3x - y = 0$ and $2x + 3y = 0$ and perpendicular to the line $x - 5y = 2$. [04marks]
2. Calculate the value of k and mean of the distribution with probability density function $f(x) = ke^{-3x}$ where $0 \leq x < \infty$. [05marks]
3. Calculate $P(A \cup B)$ where $P(A) = 0.4, P(B) = 0.42$ if A and B are mutually exclusive events. [03marks]
4. Find the equation of a circle whose centre is at $(1, -2)$ and radius $\sqrt{13}$. [04marks]
5. Find the eccentricity and foci of the hyperbola $\frac{x^2}{36} - \frac{y^2}{25} = 1$. [04marks]

SECTION B: CO ORDINATE GEOMETRY

6. (a). Show that the equation $x^2 - 8y - 6x + 1 = 0$ represents a parabola. Find the coordinates of its vertex, focus and the equations of its directrix, axis and latus rectum. Hence sketch the curve. [14marks]
- (b). Find the equation of a straight line which is parallel to PQ with $P(2, 5), Q(-1, 2)$ and bisects, the line joining the points $A(-2, 2)$ and $B(4, 6)$. [06marks]

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7. (a). Show that the equation $9x^2 + 16y^2 - 18x - 32y - 119 = 0$ represents an ellipse. Find the co-ordinates of its centre, foci and the equations of its directrices and axes. Hence sketch the ellipse. [14marks]
- (b). Show that $r = \frac{3}{1 - \cos \theta}$ is a polar form of a parabola. [06marks]
8. (a). Find the condition for which the line $y = mx + c$ touches the parabola $y^2 + 12x = 0$. Hence obtain the equation of the tangent whose slope is 3. [10marks]
- (b). Sketch the curve $r = 2(1 - \cos \theta)$ in polar form. [10marks]

SECTION C: STATISTICS

9. (a) For a Binomial distribution with 5 trials and $p = 0.4$, find the probability that:
- six trials are successful
 - only two are successful
 - None of the trials is successful
 - Exactly four are successful
- [12marks]
- (b). If a card is randomly selected from a deck of cards, find the probability that it is
- A red card or a heart.
 - A Queen or a spade.
- [08marks]
10. (a) Three balls are drawn at random without replacement from a bag containing 18 blue, 9 Red and 13 yellow balls. Find the probability that:
- the balls are of different colours
 - 2 of the balls are yellow and one is red.
- [10marks]
- (b) The death rate in a certain village follows a poisson distribution with an average death of 2 per annum. What is the probability that in a certain year there will be
- no death,
 - at least 4 deaths and
 - exactly 6 deaths?
- [10marks]
11. (a) The following are marks obtained by ten students out of a maximum of 10 marks for each subject in a test:

Commerce	X	10	9	8	8	7	7	6	6	5	4
Economics	Y	6	6	7	7	8	8	9	9	10	10

- Calculate \bar{x} and \bar{y}
 - Calculate the correlation coefficient r .
 - Interpret the value of this coefficient.
 - Calculate Spearman's rank correlation coefficients.
 - Interpret the values of the coefficient
 - Do the values in (ii) and (iv) above show any correspondence? [14marks]
- (b). If $X \approx N(60, 6.25)$ Find: (i) $P(X \leq 58)$, (ii) $P(X \geq 64)$ and (iii) $P(54 \leq X \leq 62)$. [06marks]