[5mks]

RESOURCEFUL MOCK 2017 U.A.C.E MATHEMATICS PAPER 1 TIME: 3 HOURS

Answer **all** questions in section **A** and any **five** in section **B** Any additional question(s) answered will not be marked All necessary working must be shown clearly. Begin each answer on a fresh sheet of paper. Graph paper is provided. Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A

1. Solve the simultaneous equations

X - 2y - 2z = 0 2X + 3y + Z = 13X - y - 3Z = 3

2. Find the equation of a line through S (1, 0, 2) and T (3, 2, 1) in the form $r = a + \lambda b$. Hence deduce the Cartesian equation of the line. [5mks]

3. Find
$$\int X (1 - X^2)^{\frac{1}{2}} dx$$
 [5mks]

4. Show that
$$\tan^{-1}(\frac{1}{2}) + \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{7}{9}\right)$$
 [5mks]

5. If
$$y = \frac{3-2x}{4+X^2}$$
 find the range of possible values of Y for real X. [6mks]

- 6. Differentiate e^{ax^2} with respect to X. [4mks]
- 7. Given the points O (0, 0) and P (4, 2). A is the locus of the points such that OA: AP = 1: 2. Q is the mid point of AP. Find the locus of Q in its simplest form. [5mks]
- 8. Solve the equation $\log_2 X \log_X 8 = 2$ [5mks]

SECTION B

- 9. a) The function F (x) = X³ + PX² 5x + q has a factor (x 2) and has a value of 5 when X = -3, find P and q. [4mks]
 b) The roots of the equation ax² + bx + C = 0 are ∝ and β. Form the equation whose roots are ^α/β and ^β/α [5mks]
 c) Simplify √3-2 / (2√3+3) in the form P + q √3 where P, q are rational numbers. [3mks]
- 10. If $y = tan \frac{(X+1)}{2}$ show that $\frac{d^2y}{dX^2} = y \frac{dy}{dx}$

- b) Find the equation of the tangent to the curve $X^2 + Y^2 2xy = 4X$ at (1, -1)
- 11. a) Given that $OP = \begin{pmatrix} 4 \\ -3 \\ 5 \end{pmatrix}$ and $OQ = \begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}$. Find the coordinates of the point R such

that \overline{PR} : PQ = 1: 2 and the points PQ and R are collinear.

b) Show that vector 5i - 2j + K is perpendicular to the line r = i - 4j + t (2i + 3j - 4K)

c) Find the equation of the plane through the point with position vector 5i - 2j + 3K perpendicular to the 3i + 4j - K.

- 12. a) Find the first three terms of the expansion (2 x)⁶ and use it to find (1.998)⁶ correct to the decimal places. [7mks]
 b) Expand (1 3X + 2X²)⁵ in ascending powers of X as far as the X² term.
- 13. Solve
 - a. $4 \sin^2 \theta 12 \sin 2\theta + 35 \cos^2 \theta = 0$ for $0^0 \le \theta \le 90^0$ [6mks] b. $3\cos \theta - 2\sin \theta = 2$ for $0 \le \theta \le 360$ [6mks]
- 14. a) Given that the complex number Z and its conjugate \overline{Z} satisfy the equation $Z\overline{Z}$ + 2i Z = 12 + 6i. Find Z. [7mks] b) One root of the equation $\overline{Z^3} = 2\overline{Z^2} = 0\overline{Z} + 12 = 0$ is 2 + 2i. Determine the

b) One root of the equation $Z^3 - 3Z^2 - 9Z + 13 = 0$ is 2 + 3i. Determine the other roots. [5mks]

15. Resolve $Y = \frac{X^3 + 5X^2 - 6X + 6}{(X-1)^2 (X^2+2)}$ into partial fractions. Hence find $\int Y \, dx$ and $\frac{dy}{dx}$ [12mks]

END