mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE SURVEYOR'S CERTIFICATE OF COMPETENCY EXAMINATION

MATHEMATICS

DATE: 12 APRIL 2016

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 to 11h30)

NOTE:

- This question paper consists of ~~FIVE~~ Four pages including cover page.
- All questions must be answered.
- All answers and sketches to be presented in a neat and decipherable manner. Papers will not be marked if not decipherable.
- Restrict the use of highlighters.
- Do not use a red pen.
- Read the instructions on the front page of your answer book carefully.
- No cellular phones shall be allowed in the examination venue.
- The use of computers, laptops and palmtops is prohibited.
- The make and model of your calculator must be shown on the front cover of your answer book.
- All steps must be shown.

QUESTION 1

(a) Find the equation of the parabola passing through (1;0), (-1;6), and (3;2).

(b) Calculate the intercepts on the x-axis.

(c) Calculate the intercept on the y-axis.

(d) Determine the co-ordinates of the turning point of the parabola.

[15 marks]

QUESTION 2

Simplify:

(a) $\frac{3\times2^{x+1} - 4\times2^{x-1}}{2^{x-3}}$ (5)

(b) $\frac{12^{x-2} \times 2^{x+2}}{8^{x} \times 3^{x-4}}$ (6)

(c) $\frac{2.2^{x+3}}{(2^{x})^{x-1}} \div \frac{4^{x+1}}{(2^{x+1})^{x-1}}$ (4)

[15 marks]

QUESTION 3

Solve for x:

(a) $\log_2(1-x) = 3 - \log_2(5+x)$ (6)

(b) $2^{2x} - \frac{9.2^{x}}{8} + \frac{1}{8} = 0$ (4)

(c) $4^{(x+1)(x-3)} = 8^{-x}$ (5)

(d) $3^{x+1} - 3^{x+3} = -11 + 3^{x+2}$ (5)

[20 marks]

QUESTION 4

Factorise the following:

(a) $2x^3 + 4x^2 + 3x + 6$ (3)

(b) $3x^3 + x^2 - 12x - 4$ (3)

[6 marks]

QUESTION 5

Consider the following sequences:

sequence 1 : $\sqrt{2}; 2\sqrt{2}; 3\sqrt{2}; \ldots$

sequence 2 : $\sqrt{2}; 2; 2\sqrt{2}; \ldots$

(a) Show that sequence 1 is arithmetic.

(b) Show that sequence 2 is geometric.

(c) Which term of sequence 1 will be equal to $\sqrt{200}$?

(d) Which term of sequence 2 will be equal to 256?

[10 marks]

QUESTION 6

Determine the co-ordinates of the centre and length of the radius of the following:

$x^2 + 2x + y^2 - 10y + 1 = 0$

[5 marks]

QUESTION 7

(a) Find from first principles the gradient of $f(x) = 1 - 3x^2$ at any point. (7)

(b) Hence find $f'(4)$, the derivative of f at $x = -4$. (2)

(c) What is the gradient of the tangent to f at $x = 5$? (2)

[11 marks]

QUESTION 8

Prove that:

(a) $\frac{1 + \sin 2A}{\cos 2A} = \frac{\cos A + \sin A}{\cos A - \sin A}$ (6)

(b) $\frac{1 - \cos 2\theta}{\sin 2\theta} = \tan\theta$ (5)

(c) $\cot 54° . \operatorname{cosec} 144° + \sec 144° . \cos^2 126° = \cos 36°$ (7)

[18 marks]

TOTAL [100 marks]