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Examination Answer Books

Candidate's Exam Number: _____

Book No.

1

Total Books
Handed In:

2

Complete, fold and seal
(see note 1 below)

SURNAME: RUSSELL

FORENAME(S): FERGUS GAVIN

MURRAY

STUDENT NUMBER: 1810348

Programme Title: BENG OME ENGINEERING

Year/Level/Stage: LEVEL 4

Examination Paper Title: MATHEMATICS TEST 1 - M4X00391

Examination Paper Ref No.: _____

Desk Letter/Number: _____

Date: 15/11/2019

Time: 0900 am/pm

Room Name or No.: ROOM 5

Instructions to Candidates:

- Please give the information requested above and enter your name in the space provided at the top right of this page. If your answers are to be marked under a scheme whereby the examiners will not know your identity, fold over and seal down the top right-hand corner of the page (using the gummed label provided) in order to conceal your name.
- Commence each answer on a fresh page.
- Do all rough work in the answer book and cross through it.
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Summary of Marks

Question Numbers Answered	1st Examiner	2nd Examiner (optional)	3rd Examiner (optional)
3	31		
2	~~18 1/2~~		
	30 1/2		
	61.5		
	~~47 1/2~~		
TOTAL			
RESULT			

Examination Answer Book

Examination Name: _____

Registration No: _____

Roll No: _____

Page No: _____



Question No: _____

Answer: _____

Examination Date: _____

Examination Time: _____

Examination Place: _____

Examination Year: _____

Examination Month: _____

Examination Day: _____

Instructions to Candidates

1. Candidates must write their names and roll numbers in the spaces provided at the top of the page.

2. Candidates must write their answers in the spaces provided below the questions.

3. Candidates must write their answers in the spaces provided below the questions.

4. Candidates must write their answers in the spaces provided below the questions.

5. Candidates must write their answers in the spaces provided below the questions.

6. Candidates must write their answers in the spaces provided below the questions.

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14. Candidates must write their answers in the spaces provided below the questions.

15. Candidates must write their answers in the spaces provided below the questions.

16. Candidates must write their answers in the spaces provided below the questions.

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18. Candidates must write their answers in the spaces provided below the questions.

19. Candidates must write their answers in the spaces provided below the questions.

20. Candidates must write their answers in the spaces provided below the questions.

Q3 a)

$$7x + 4y = 46$$

$$8x + 6y = 57$$

$$7x + 4y = 46 \quad (1)$$

$$8x + 6y = 57 \quad (2)$$

$$(2) - (1)$$

$$x - 2y = 11$$

$$x - 2y - 11 = 0$$

set x to 0

$$-2y - 11 = 0$$

$$-2y = 11$$

$$y = -5.5$$

When $y = -5.5$

$$x =$$

$$7x + 4(-5.5) = 46$$

$$7x + 22 = 46$$

$$7x = 24$$

$$x = \frac{24}{7}$$

Q3a

$$7x + 4y = 46$$

$$8x + 6y = 57$$

$$7x + 4y = 46 \quad \times 6 \quad (1)$$

$$8x + 6y = 57 \quad \times 4 \quad (2)$$

$$42x + 24y = 276 \quad (3)$$

$$32x + 24y = 228 \quad (4)$$

$$(3) - (4)$$

$$10x = 48$$

$$\underline{x = 4.8}$$

$$\text{if } x = 4.8$$

$$y = 7(4.8) + 4y = 46$$

$$y = 8(4.8) + 6y = 57$$

$$y = 33.6 + 4y = 46$$

$$y = 38.4 + 6y = 57$$

$$4y = 12.4$$

$$\underline{y = 3.1}$$

$$6y = 18.6$$

$$\underline{y = 3.1}$$

$$\text{to 1 s.f.} \quad \underline{x = 5} \quad y = 3$$

Q3b) $3x^2 + 5x - 2 = 0$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 3 \quad b = 5 \quad c = -2$$

~~2x~~

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \times 3 \times -2}}{2 \times 3}$$

$$x = \frac{-5 \pm \sqrt{49}}{6}$$

$$x = \frac{-5 \pm 7}{6}$$

$$\underline{x = -2.00} \quad \text{or} \quad \checkmark$$

$$\underline{x = 0.33} \quad \checkmark$$

5

Q3 ci)

Factorise

$$x^2 + 11x + 30 = 0$$

$$(x + 5)(x + 6)$$

$$11x = ?$$

ii)

Factorise

$$x^2 - 11x = 0$$

$$x(x - 11)$$

iii)

Factorise

$$x^2 - 4 = 0$$

$$(x - 2)(x + 2)$$

$$\begin{array}{l} \text{Difference between} \\ 2 \text{ squares} \end{array}$$

Q31)

$$i) \quad y = 6x^2 (x^3 - 2x^2 + 5x - 1)$$

$$y = 6x^5 - 12x^4 + 30x^3 - 6x^2$$

$$\frac{dy}{dx} = 30x^4 - 48x^3 + 60x^2 - 6$$

1

$$ii) \quad y = \frac{7}{x^2} - \frac{4}{x} + 8$$

$$y = 7x^{-2} - 4x^{-1} + 8$$

$$\frac{dy}{dx} = -14x^{-3} + 4x^{-2} + 8$$

4

$$\frac{dy}{dx} = -14x^{-3} + 4x^{-2}$$

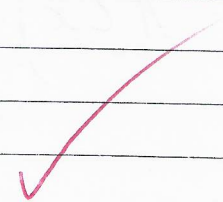
$$iii) \quad y = \frac{\sin x}{\cos x}$$

$$\frac{\sin x}{\cos x} = \tan x$$

$$y = \tan x$$

2

$$\frac{dy}{dx} = \sec^2(x)$$



Q3e)
i) $y = (2x^2 - 5x + 1)^7$

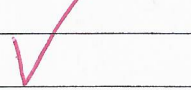
Quick method

$\frac{dy}{dx}$ of what's in bracket

$$= 4x - 5$$

$\frac{dy}{dx}$ of $y = (2x^2 - 5x + 1)^7$

$$\frac{dy}{dx} = 7(2x^2 - 5x + 1)^6 (4x - 5)$$



2

ii) e^{x^2+4}

$\frac{dy}{dx}$ of Power

$$x^2 + 4 \Rightarrow \frac{dy}{dx} = 2x$$

$$y = e^{x^2+4}$$

$$\frac{dy}{dx} = (x^2 + 4)(e^{x^2+4})(2x)$$



$$\text{iii)} \quad y = \cos^3 2x$$

$$y = 3(\cos 2x) \cdot (\cos 2x)^2$$

$$\frac{dy}{dx} \text{ of bracket} = -2 \sin 2x$$

$$\frac{dy}{dx} = 3(\cos 2x)^2 (-2 \sin 2x)$$

3

Q38) Area of triangle sides are
4.5 cm, 8.8 cm, 12.5 cm

Semi Perimeter equation

$$\sqrt{s(s-a)(s-b)(s-c)} \quad s = \frac{4.5 + 8.8 + 12.5}{2}$$

$$s = 12.9$$

$$\begin{aligned} \text{Area} &= \sqrt{12.9(12.9 - 4.5)(12.9 - 8.8)(12.9 - 12.5)} \\ &= \underline{\underline{13.33 \text{ cm}^2}} \end{aligned}$$

5

31

Q2a) i) Factorise

$$4 - q^2$$

$$4 - q^2 = 0$$

$$4 = q^2$$

$$q^2 - 4 = 0$$

$$(q - 2)(q + 2)$$

difference of 2
squares

1

ii) $3ab + 4cd - cb - 12ad$

$$3ab - 12ad + 4cd - cb$$

$$a(3b - 12d) + c(4d - b)$$

X

 $\frac{1}{2}$

iii) $p^2 - 2p - 63$

Quadratic Use

Formula — doesn't say I
can or can't

$$a = 1 \quad b = -2 \quad c = -63$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{2 \pm \sqrt{-2^2 - 4 \times 1 \times -63}}{2 \times 1}$$

$$= \frac{2 \pm \sqrt{4 - -252}}{2}$$

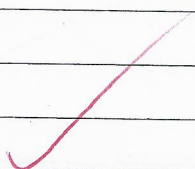
$$= \frac{2 \pm 16}{2}$$

$$x = 9 \quad x = 7$$

$$(p + 9)(p + 7)$$

$$\text{iv)} \quad q^2 - 4qr$$

$$\underline{\underline{q(q - 4r)}}$$



1

$$\text{2b)i)} \quad (2x-1)(3x+5) = (6x-5)(x-9)$$

$$\cancel{6x^2} - 3x + 10x - 5 = \cancel{6x^2} - 5x - 54x + 45$$

$$-3x + 10x - 5 = -5x - 54x + 45$$

$$-3x + 10x + 5x + 54x = 50$$

$$66x = 50$$

$$x = \frac{50}{66} = 0.75 \quad 0.76 \text{ (2 dec places)}$$

4

$$\text{2b)ii)} \quad \frac{x-4}{5} = \frac{2x-1}{3}$$

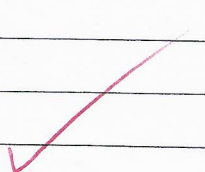
cross multiply

$$3(x-4) = 5(2x-1)$$

$$3x - 12 = 10x - 5$$

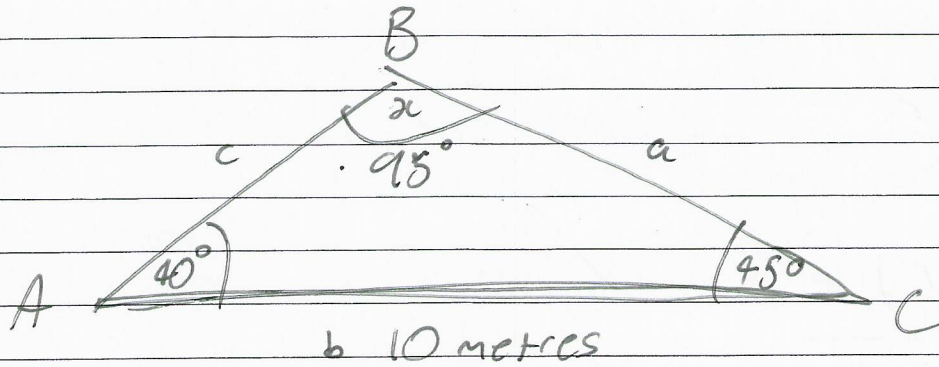
$$-7x = 7$$

$$\underline{\underline{x = -1.00}}$$



4

Q2c)



$$\angle x = 180 - 40 - 45 = 95^\circ$$

Length AB

Length of BC

Sine Rule

Sine Rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad \frac{a}{\sin A} = \frac{b}{\sin B} \Rightarrow \frac{c}{\sin B}$$

$$\frac{10}{\sin 95} = \frac{c}{\sin 45}$$

$$\frac{a}{\sin 40} = \frac{10}{\sin 95}$$

$$10.038 = \frac{c}{\sin 45}$$

$$\frac{a}{\sin 40} = 10.038$$

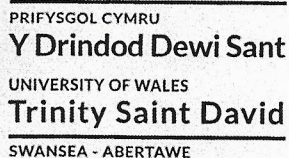
$$c = (10.038) \sin 45$$

$$a = \sin 40 (10.038)$$

$$= \underline{\underline{7.097m}}$$

$$a = \underline{\underline{6.452m}}$$

16 1/2



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Year/Level/Stage: LEVEL 4 - MAX 00391

Examination Paper Title: MATHEMATICS STAGE 1 TEST 1

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2	~~IXX~~		
TOTAL			
RESULT			

Q20

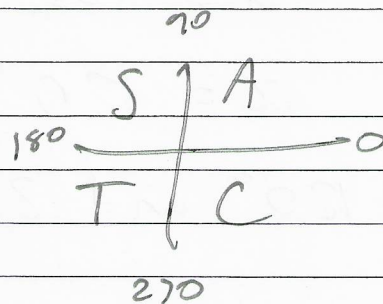
Q21)

$$4 \sin x = -3$$

$$\sin x = \frac{-3}{4}$$

$$x = \sin^{-1}\left(\frac{-3}{4}\right)$$

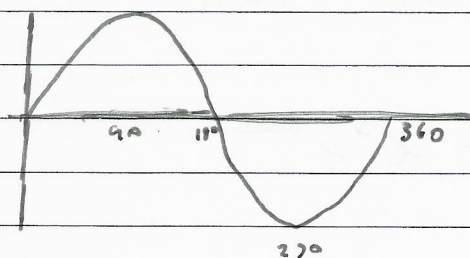
$$x = -48.59^\circ$$



$$x = 270 - 48.59$$

and

$$x = 360 - 48.59$$



$$\underline{x = 221.41^\circ \text{ and } x = 311.41^\circ}$$

2

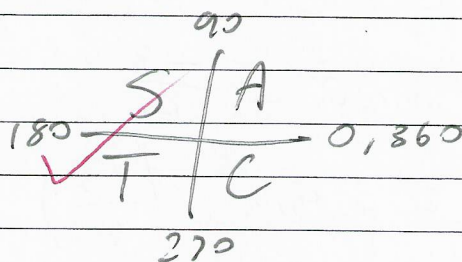
Q2 di)

$$\cos x = -0.5$$

$$x = \cos^{-1}(-0.5)$$

$$x = 120^\circ$$

$$x = 120^\circ \text{ and } 240^\circ$$



2

Q2e): Product Rule

$$y = x^3 e^{2x}$$

$$u = x^3 \therefore \frac{du}{dx} = 3x^2$$

$$v = e^{2x} \therefore \frac{dv}{dx} = 2e^{2x}$$

$$\frac{dy}{dx} = (x^3)(3x^2) + (e^{2x})(2e^{2x})$$

$$= 3x^5 + 2e^{4x}$$

ii)

$$y = \sin 5x \cos 3x$$

$$u = \sin 5x \therefore \frac{du}{dx} = 5 \cos 5x$$

$$v = \cos 3x \therefore \frac{dv}{dx} = -3 \sin 3x$$

$$\frac{dy}{dx} = (\sin 5x)(5 \cos 5x) + (\cos 3x)(-3 \sin 3x)$$

1 1/2

Q20)

$$Z = 2x^3y - 7y^3x + \sin x \cos y$$

$$\frac{\partial Z}{\partial x} = 6x^2y - 7y^3 + \cos x \cos y$$

$$\frac{\partial Z}{\partial y} = 2x^3 - 21y^2 - \sin x \sin y$$

$$\frac{\partial^2 Z}{\partial x^2} = 12xy - \sin x \cos y$$

$$\frac{\partial^2 Z}{\partial x^2} = 12xy - \sin x \cos y$$

$$\frac{\partial^2 Z}{\partial y \partial x} = 6x^2 - 21y^2 - \cos x \sin y$$

$$\frac{\partial^2 Z}{\partial x \partial y} = 6x^2 - 21y^2 - \cos x \sin y$$

7

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