

8 Pages

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1	Student Number	
2	Title of Examination Paper	CLASS TEST 2
3	Module Code	PSDE4003
4	Date and Time of Examination	
5	Examination Venue	
6	Seat Number	
7	Number of Answer Books handed in	

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

Please complete this section and SEAL before the examination starts.

Surname JONES (Block Capitals) Forename(s) THOMAS WYN

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PATENT PENDING
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Class Test 2

~~1a)~~ i) $v = 2s^4 - \frac{5}{s^2} + \sqrt{s}$

$$v = 2s^4 - 5s^{-2} + s^{1/2}$$

$$\frac{dv}{ds} = 8s^3 + 10s^{-3} + \frac{1}{2}s^{-1/2}$$
 ✓

ii) $y = x^3 \sin 4x$ - Product rule

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$u = x^3 \quad v = \sin 4x$$

$$\frac{du}{dx} = 3x^2 \quad \frac{dv}{dx} = 4 \cos 4x$$
 ✓

$$\frac{dy}{dx} = x^3 (4 \cos 4x) + \sin 4x (3x^2)$$
 ✓

iii) $i = 3 \sin(2t + 4)$ Chain ✓

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$u = 2t + 4 \quad \frac{du}{dt} = 2$$

$$v = 3 \sin u \quad \frac{dv}{du} = 3 \cos u$$

$$\begin{aligned} \frac{di}{dt} &= 3 \cos u \cdot 2 \\ &= 6 \cos u \end{aligned}$$
 ✓

2) $V = 2e^{-10t}$
 $V = 4(2 \cdot e^{-10t})$ Initial rate of growth = 0

$\frac{dV}{dt} = 4(2 \cdot 10e^{-10t})$

$\frac{dV}{dt} = 80e^{-10t}$

$\frac{dV}{dt} = 80e^{-10(0)}$

$= 80e^0$

$= 80$

3) a) $\int_2^4 (5 + 3t + 4t^2) dt$

$= \left[\frac{5t}{1} + \frac{3t^2}{2} + \frac{4t^3}{3} \right]_2^4$

$= \left[\frac{5(4)}{1} + \frac{3(4)^2}{2} + \frac{4(4)^3}{3} \right] - \left[\frac{5(2)}{1} + \frac{3(2)^2}{2} + \frac{4(2)^3}{3} \right]$

$= 129.3 - 26.6 = 102.7$

b) $\int_0^{\pi/2} (2 \sin 3x + 3 \cos 2x) dx$

$\int_0^{\pi/2} (2 \sin 3x + 3 \cos 2x) dx$

$= \left[2 \cdot \frac{1}{3} \cos 3x + 3 \cdot \frac{1}{2} \sin 2x \right]_0^{\pi/2}$

$= \left[2 \cdot \frac{1}{3} \cos 3(\pi/2) + 3 \cdot \frac{1}{2} \sin 2(\pi/2) \right] - \left[2 \cdot \frac{1}{3} \cos(0) + 3 \cdot \frac{1}{2} \sin 2(0) \right]$

$= 0 - 0.6$

$= -0.6$

4) $\frac{6}{(s-2)(s+1)}$

$6 = \frac{A}{(s-2)} + \frac{B}{(s+1)}$ multiply

$6 = A(s+1) + B(s-2)$

To calculate A

To work B out

$6 = A(2+1) + B(2-2)$

$6 = A(-1+1) + B(-1-2)$

$6 = 3A + 0B$

$6 = 0A + -3B$

$A = \frac{6}{3}$

$B = \frac{6}{-3}$

Evaluate into $\int_4^6 \frac{6}{(s-2)(s+1)}$

$\int_4^6 \frac{6}{3} \left[\frac{1}{(s-2)} \right] + \frac{-6}{3} \left[\frac{1}{(s+1)} \right]$

$= \int_4^6 \frac{6}{3} \left[\frac{1}{1} \ln 2 \right] + \frac{-6}{3} \left[\frac{1}{1} \ln 1 \right]$

$= \frac{6}{3} \left[\frac{1}{1} \ln 3 - \ln 2 \right] + \frac{-6}{3} \left[\frac{1}{1} \ln 6 - \ln 5 \right]$

$= 0.810 - 0.364$

$= 0.446$

$\frac{14}{10}$

$\frac{12}{18}$

5) Estimate $\int \frac{6}{(s-2)(s+1)}$ using trap rule to 4 strips

$$h = \frac{b-a}{n}$$

$$= \frac{5-4}{4} = 0.25$$

4	4.25	4.5	4.75	5
0.6	0.507	0.436	0.379	0.3
y_0	y_1	y_2	y_3	y_n

Trapezium rule: $h \left\{ \frac{1}{2}(y_0 + y_n) + y_1 + y_2 + y_3 \right\}$

$$= 0.25 \left\{ \frac{1}{2}(0.6 + 0.3) + 0.507 + 0.436 + 0.379 \right\}$$

$$= 0.443$$

Percentage error = $0.443 \div 0.446 = 0.993$

$$= 0.993 \times 100$$

$$= 99.327$$

$$100 - 99.327$$

percentage error = 0.673% X.

$$\frac{10}{14}$$

Time	Frequency (f)	x	fx	(x - $\bar{x}$)	(x - $\bar{x}$) ²	$\sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$
0-5	11	2.5	27.5	2.5 - 12.15 = -9.65	93.122	9.6499
5-10	25	7.5	187.5	7.5 - 12.15 = -4.65	21.622	4.6499
10-15	33	12.5	412.5	12.5 - 12.15 = 0.35	0.122	0.3492
15-20	22	17.5	385	17.5 - 12.15 = 5.35	28.622	5.3499
20-25	9	22.5	202.5	22.5 - 12.15 = 10.35	107.122	10.3499

$$\sum fx = 1215$$

$$\sum f = 100$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$$\bar{x} = \frac{1215}{100} = 12.15$$

7) A works - 0.35
B works - 0.65

a) Series

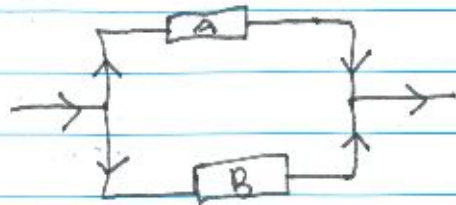


$$A \times B = (0.35) \times (0.65) = 0.2275$$

Probability the both switches in series
= 0.2275

$$\frac{5}{14}$$

b) Parallel



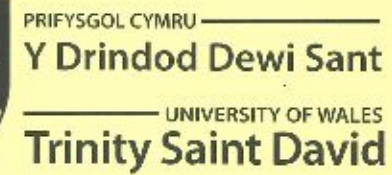
~~Probability = $1 - (0.35) \times (0.65)$~~

~~Probability~~ $1 - (\text{Probability A doesn't work}) \times (\text{Probability B doesn't work})$

$= 1 - (0.35 \times 0.65)$ ✓

$= 0.7725$ ✓

~~$\frac{8}{8}$~~



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(Gweler yr ochr arall am y fersiwn Cymraeg)

Please complete this section and SEAL before the examination starts.

Surname Davies (Block Capitals) Forename(s) Jed Lloyd.

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1.

$$i) v = 2s^4 - \frac{5}{s^2} + \sqrt{s}$$

$$v = 2s^4 - 5s^{-2} + s^{1/2}$$

~~$$\frac{dv}{ds} = 8s^3 + 10s^{-3} + \frac{1}{2}s^{-1/2}$$~~

$$\frac{dv}{ds} = 8s^3 + 10s^{-3} + \frac{1}{2}s^{-1/2}$$



$$ii) y = x^3 \sin 4x$$

$$u = x^3$$

$$v = \sin 4x$$

~~$$\frac{dy}{dx} = 3x^2 \sin 4x + x^3 \cos 4x$$~~

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

$$\frac{dv}{dx} = 4 \cos 4x$$

~~$$\frac{dy}{dx} = 3x^2 \sin 4x + x^3 \cos 4x$$~~

$$\frac{dy}{dx} = x^3 4 \cos 4x + \sin 4x (3x^2)$$

$$= 4x^3 \cos 4x + 3x^2 \sin 4x$$



$$iii) i = 3 \sin(2t+4)$$

(Chain).

$$u = 2t+4$$

$$v = 3 \sin.$$

$$\frac{du}{dt} = 2$$

$$\frac{dv}{du} = 3 \cos.$$

~~$$\frac{di}{dt} = 3 \cos \times 2$$~~

$$= 6 \cos(2t+4)$$



22/22

$$2. \quad v = 4(2 - e^{-10t})$$

$$v = 8 - 4e^{-10t}$$

$$\frac{dv}{dt} = 40e^{-10t}$$

$$\text{Initial time } (t) = 0.$$

$$40e^{-10 \times 0} = 1.816 \text{ mV.}$$

$$3. \quad a) \int_2^4 (5 + 3t + 4t^2) dt$$

$$= \left[5x + \frac{3t^2}{2} + \frac{4t^3}{3} \right]_2^4$$

$$= \left[5(4) + \frac{3(4^2)}{2} + \frac{4(4^3)}{3} \right] - \left[5(2) + \frac{3(2^2)}{2} + \frac{4(2^3)}{3} \right]$$

$$= 129.33 - 26.67$$

$$= 102.66$$

$$b) \int_0^{\frac{\pi}{2}} (2 \sin 3x + 3 \cos 2x) dx$$

$$= \left[-\frac{1}{3} \times 2 \cos 3x + \left(3 \times \frac{1}{2} \right) \sin 2x \right]$$

$$= \left[-\frac{1}{3} \times 2 \cos 3\left(\frac{\pi}{2}\right) + \left(3 \times \frac{1}{2} \right) \sin 2\left(\frac{\pi}{2}\right) \right] - \left[-\frac{1}{3} \times 2 \cos 3(0) + \left(3 \times \frac{1}{2} \right) \sin 2(0) \right]$$

$$= 0 - \left(-\frac{2}{3} \right)$$

$$= \frac{2}{3}$$

$$4. \quad \frac{6}{(s-2)(s+1)} = \frac{A}{(s-2)} + \frac{B}{(s+1)}$$

$$6 = A(s+1) + B(s-2)$$

$$\text{Let } s+1=0, \text{ so } s=-1$$

$$6 = A(0) + B(-1-2)$$

$$6 = -3B$$

$$\frac{6}{-3} = B$$

$$B = -2$$

$$\text{Then let } s-2=0, \text{ so } s=2$$

$$6 = A(2+1) + B(0)$$

$$6 = 3A$$

$$\frac{6}{3} = A$$

$$A = 2$$

$$\frac{6}{(s-2)(s+1)} = \frac{2}{(s-2)} + \frac{-2}{(s+1)}$$

$$= 2 \ln(s-2) + (-2 \ln(s+1))$$

8.

$$\frac{15}{16}$$

7

$$\int_4^5 \frac{6}{(s-2)(s+1)} = 2 \ln(s-2) - 2 \ln(s+1)$$

$$= \left[2 \ln(s-2) - 2 \ln(s+1) \right]_4^5$$

$$= \left[2 \ln(5-2) - 2 \ln(5+1) \right] - \left[2 \ln(4-2) - 2 \ln(4+1) \right]$$

$$= -1.386 - (-1.833)$$

$$= 0.447$$

$$\frac{18}{18}$$

5. $\int_4^5 \frac{6}{(s-2)(s+1)}$ (4 strips)

$$h = \frac{5-4}{4} = 0.25$$

s	y ₀	y ₁	y ₂	y ₃	y ₄
4	4	4.25	4.5	4.75	5
y	0.6	0.508	0.436	0.379	0.333

Trapezium Rule.

$$= h \left[\frac{1}{2} (y_0 + y_n) + y_1 + y_2 + y_3 \right]$$

$$= 0.25 \left[\frac{1}{2} (0.6 + 0.333) + 0.508 + 0.436 + 0.379 \right]$$

$$= 0.447375$$

$$= 0.447$$

Percentage Error = 0%

$$\frac{14}{14}$$

6. Time(s)	Freq	x	fx	f(x - $\bar{x}$) ²
0-5	11	2.5	27.5	1024.375
5-10	25	7.5	187.5	540.5625
10-15	33	12.5	412.5	4.0425
15-20	22	17.5	385	629.695
20-25	9	22.5	202.5	964.1025
$\Sigma f = 100$			$\Sigma fx = 1215$	$\Sigma f(x - \bar{x})^2 = 3162.75$

$$\text{Mean}(\bar{x}) = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{1215}{100}$$

$$= 12.15$$

$$\text{Standard Deviation}(\sigma) = \sqrt{\frac{\Sigma f(x - \bar{x})^2}{\Sigma f}}$$

$$= \sqrt{\frac{3162.75}{100}}$$

$$= 5.6238$$

$$\frac{13}{14}$$

7. Switch A = 0.35.
Switch B = 0.65.

a) In Series

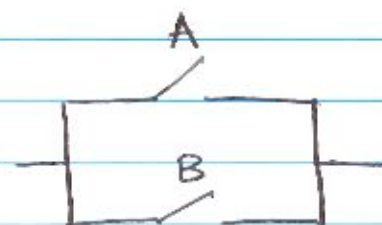


Probability Both Work = $P(A) \times P(B)$

$$= 0.35 \times 0.65.$$

$$= 0.2275. \checkmark$$

b) In Parallel



Probability at least one works = $1 - (\text{Both Don't Work})$

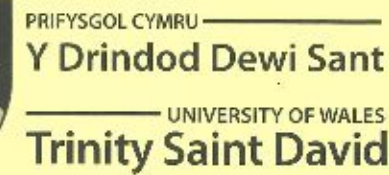
$$P(\text{Both don't work}) = 0.65 \times 0.35$$

$$= 0.2275. \checkmark$$

$$\text{Prob (At least 1 works)} = 1 - 0.2275. \checkmark$$

$$= 0.7725. \checkmark$$

$$\frac{8}{8} \checkmark$$



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3	Module Code	PDSE 4003
4	Date and Time of Examination	23 APR 2018 14.30 - 16.30
5	Examination Venue	G9 G BLOCK
6	Seat Number	
7	Number of Answer Books handed in	1

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Surname EVANS (Block Capitals) Forename(s) DANIEL ROSS

PATENT PENDING

(Gweler yr ochr arall am y fersiwn Cymraeg)

1)

$$i. v = 2s^4 - \frac{5}{s^2} + \sqrt{s} :$$

$$v = 2s^4 - 5(s^{-2}) + \sqrt{s} \quad (1) \checkmark$$

$$\frac{dv}{ds} = 8s^3 + 10s^{-3} + \frac{1}{2}s^{-1/2} \quad (4) \checkmark$$

$$= 8s^3 + 10s^{-3} + \frac{1}{2}s^{-1/2} \quad \checkmark$$

$$ii) y = x^3 \sin(4x)$$

$$y = u \cdot v$$

$$u = x^3 \quad v = \sin(4x)$$

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

$$\frac{dv}{dx} = 4 \cos(4x) \quad (3) \checkmark$$

$$\frac{dy}{dx} = u \cdot \frac{dv}{dx} + v \cdot \frac{du}{dx}$$

$$\frac{dy}{dx} = x^3 (4 \cos(4x)) + \sin(4x) \cdot 3x^2 \quad (3) \checkmark$$

$$iii) i = 3 \sin(2t + 4)$$

$$i = v \cdot u$$

$$v = 3 \sin(u)$$

$$u = (2t + 4)$$

$$\frac{dv}{dt} = 3 \cos(u)$$

$$\frac{du}{dt} = 2$$

$$\frac{di}{dt} = \frac{dv}{dt} \cdot \frac{du}{dt} \quad \times$$

$$\frac{di}{dt} = 2 \cdot 3 \cos(u) \quad (2) \checkmark$$

should be

$$\frac{di}{dt} = \frac{dv}{du} \cdot \frac{du}{dt}$$

$$= 3 \cos u \cdot 2$$

$$= 6 \cos u$$

$$= 6 \cos(2t + 4)$$

$$= 6 \cos(2t+4) \quad \checkmark \quad (2) \quad \checkmark$$

(17)

$$2) \quad v = 4(2 - e^{-10t})$$

$$\frac{dv}{dt} = 4(0 - (-10)e^{-10t}) \quad \checkmark$$

$$\frac{dv}{dt} = 4(10e^{-10t}) \quad \checkmark \quad (3) \quad \checkmark$$

If $t=0s$ then:-

$$\begin{aligned} &= 4(10e^{-10(0)}) \\ &= 4(10e^{-10(0)}) \\ &= \underline{\underline{40}} \end{aligned} \quad \checkmark \quad (1) \quad \checkmark \quad (2) \quad \checkmark$$

(6)

$$3) a) \int_2^4 (5 + 3t + 4t^2) dt \quad \checkmark \quad (2) \quad \checkmark$$

~~$\int_2^4 (t + \frac{3t^2}{2} + \frac{4t^3}{3}) dt$~~ You have already integrated this! This!

$$\left(\frac{(4)}{1} + \frac{3(4)^2}{2} + \frac{4(4)^3}{3} \right) - \left(\frac{(2)}{1} + \frac{3(2)^2}{2} + \frac{4(2)^3}{3} \right) \quad \checkmark \quad (2) \quad \checkmark$$

$$= 113.3 - 18.6$$

$$= \underline{\underline{94.7}} \quad \times \quad (2) \quad \checkmark$$

↓ error carried forward

$$3) b) \int_0^{\pi/2} (2 \sin 3x + 3 \cos 2x) dx$$

~~Wait~~

$$\int_0^{\pi/2} \left(-\frac{2}{3} \cos 3x + \frac{3}{2} \sin 2x \right) dx \quad \text{①} \quad \text{Same error as before here!}$$

error carried forward

$$\int \left(-\frac{2}{3} \cos 3(\pi/2) + \frac{3}{2} \sin 2(\pi/2) \right) - \left(-\frac{2}{3} \cos 3(0) + \frac{3}{2} \sin 2(0) \right)$$

$$= 0 - 0.785$$

$$= -0.785 \quad \text{②} \quad \text{⑨}$$

$$4) \frac{6}{(s-2)(s+1)} = \frac{A+B}{(s-2)(s+1)} = \frac{A}{s-2} + \frac{B}{s+1} \quad \text{①}$$

Multiply through both sides ~~using~~ ^{by} the denominator

$$6 = A(s+1) + B(s-2) \quad \text{②}$$

To calc A, let $s=2$

$$6 = A(s+1) + B(s-2)$$

$$6 = A(2+1) + B(2-2)$$

$$6 = A(3) + B(0)$$

$$6 = 3A$$

$$\frac{6}{3} = A$$

$$A = \frac{6}{3}$$

$$= 2$$

To calc B, let $s=-1$

$$6 = A(s+1) + B(s-2)$$

$$6 = A(-1+1) + B(-1-2)$$

$$6 = A(0) + B(-3)$$

$$6 = -3B$$

$$\frac{6}{-3} = B$$

$$B = \frac{6}{-3} = -2 \quad \text{②}$$

$$\int_0^5 \frac{6}{(s-2)(s+1)} ds$$

⑦

Time	Freq (f)	Mid x	fx	$(x - \bar{x})$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
0-5	11	2.5	27.5	-9.65	93.1225	1024.8475
5-10	25	7.5	187.5	-4.65	21.6225	540.5625
10-15	33	12.5	412.5	0.35	0.1225	4.0425
15-20	22	17.5	385	5.35	28.6225	629.695
20-25	9	22.5	202.5	10.35	107.1225	964.1025
$\Sigma f = 100$			$\Sigma fx = 1215$		$\Sigma f(x - \bar{x})^2 = 3162.75$	

$$\bar{x} = \frac{\Sigma fx}{\Sigma f}$$

$$\bar{x} = \frac{1215}{100}$$

$$\bar{x} = 12.15$$

$$\text{Mid } x = \frac{0+5}{2} = 2.5$$

$$\frac{5+10}{2} = 7.5$$

$$\frac{10+15}{2} = 12.5$$

$$\frac{15+20}{2} = 17.5$$

$$\frac{20+25}{2} = 22.5$$

$$\Sigma f = 11 + 25 + 33 + 22 + 9 = 100$$

$$\Sigma fx = 27.5 + 187.5 + 412.5 + 385 + 202.5 = 1215$$

$$\Sigma f(x - \bar{x})^2 = 1024.8475 + 540.5625 + 4.0425 + 629.695 + 964.1025 = 3162.75$$

$$(x - \bar{x})$$

$$(0-5) = 2.5 - 12.15 = -9.65$$

$$(5-10) = 7.5 - 12.15 = -4.65$$

$$(10-15) = 12.5 - 12.15 = 0.35$$

$$(15-20) = 17.5 - 12.15 = 5.35$$

$$(20-25) = 22.5 - 12.15 = 10.35$$

$$fx$$

$$(0-5) 11 \times 2.5 = 27.5$$

$$(5-10) 25 \times 7.5 = 187.5$$

$$(10-15) 33 \times 12.5 = 412.5$$

$$(15-20) 22 \times 17.5 = 385$$

$$(20-25) 9 \times 22.5 = 202.5$$

$$(x - \bar{x})^2$$

$$(0-5) = -9.65^2 = 93.1225$$

$$(5-10) = -4.65^2 = 21.6225$$

$$(10-15) = 0.35^2 = 0.1225$$

$$(15-20) = 5.35^2 = 28.6225$$

$$(20-25) = 10.35^2 = 107.1225$$

$$f(x - \bar{x})^2$$

$$(0-5) = 11 \times 93.1225 = 1024.8475$$

$$(5-10) = 25 \times 21.6225 = 540.5625$$

$$(10-15) = 33 \times 0.1225 = 4.0425$$

$$(15-20) = 22 \times 28.6225 = 629.695$$

$$(20-25) = 9 \times 107.1225 = 964.1025$$

$$\sigma = \sqrt{\frac{\Sigma f(x - \bar{x})^2}{\Sigma f}}$$

$$\sigma = \sqrt{\frac{3162.75}{100}}$$

$$\sigma = 5.627 \text{ (3dp's)}$$

$$P(A \text{ WORKS}) = 0.35$$

$$P(B \text{ WORKS}) = 0.65$$

a) Series



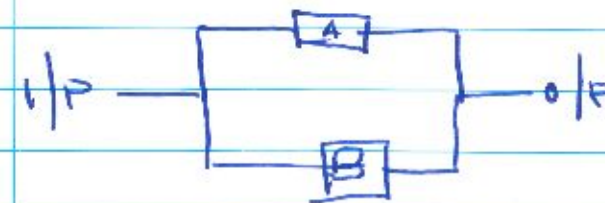
~~Probability of a connection~~

Probability of a connection = $P(A \text{ WORKS}) \times P(B \text{ WORKS})$

Probability of a connection = 0.35×0.65

Probability of a connection = 0.2275

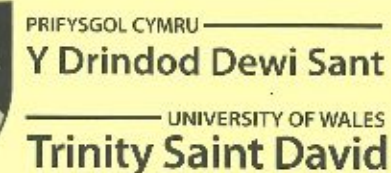
b) Parallel



Probability of a connection = $1 - P(A \text{ DOESN'T WORK}) \times P(B \text{ DOESN'T WORK})$

Probability of a connection = $1 - (0.65 \times 0.35)$

Probability of a connection = 0.7725



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1	Student Number	
2	Title of Examination Paper	Class Test 2
3	Module Code	PSDE 4003
4	Date and Time of Examination	23/Apr/2018 14:30 - 16:30
5	Examination Venue	G9
6	Seat Number	
7	Number of Answer Books handed in	1

[illegible]

Please complete this section and SEAL before the examination starts.

Surname LINCH (Block Capitals) Forename(s) James ~~Levin~~ Thomas

PATENT PENDING

(Gweler yr ochr arall am y fersiwn Cymraeg)

$$1. a) V = 2s^4 - \frac{5}{s^2} + \sqrt{s}$$

$$= 2s^4 - 5s^{-2} + s^{1/2}$$

$$\frac{dV}{ds} = 8s^3 + 10s^{-3} + \frac{1}{2}s^{-1/2}$$

$$b) y = x^3 \cdot \sin 4x$$

$$u = x^3 \quad v = \sin 4x$$

$$\frac{du}{dx} = 3x^2 \quad \frac{dv}{dx} = 4\cos 4x$$

$$\frac{dy}{dx} = u \cdot \frac{dv}{dx} + v \cdot \frac{du}{dx}$$

$$= (x^3)(4\cos 4x) + (\sin 4x)(3x^2)$$

$$= 4x^3 \cos 4x + 3x^2 \sin 4x$$

$$c) i = 3 \sin(2t+4)$$

$$u = 2t+4 \quad i = 3 \sin(u)$$

$$\frac{du}{dt} = 2 \quad \frac{di}{du} = 3 \cos(u)$$

$$\frac{di}{dt} = \frac{di}{du} \times \frac{du}{dt}$$

$$= (3 \cos(u))(2)$$

$$= 6 \cos(u)$$

$$= 6 \cos(2t+4)$$

19

2. $V = 4(2 - e^{-10t})$: find initial rate of growth

$$V = 8 - (e^{-10t}) \quad \text{①}$$

$$\frac{dV}{dt} = -10e^{-10t} \quad \text{②}$$

$$V = 8 - (-10e^{-10t}) = 8 + 10e^{-10t}$$

$$= 18e^{-10t}$$

initial rate of growth = 0 (as 0 is the "initial" starting point). ①

$$V = 18e^{-10(0)}$$

$$= 18e^0$$

$$= 18 \times 1$$

$$= 18$$

6

3. a) $\int_2^4 (5 + 3t + 4t^2) dt$

you've integrated already

$$= \left[5t + \frac{3t^2}{2} + \frac{4t^3}{3} \right]_2^4$$

$$= \left[5\left(\frac{4}{1}\right) + \frac{3\left(\frac{4}{1}\right)^2}{2} + \frac{4\left(\frac{4}{1}\right)^3}{3} \right] - \left[5\left(\frac{2}{1}\right) + \frac{3\left(\frac{2}{1}\right)^2}{2} + \frac{4\left(\frac{2}{1}\right)^3}{3} \right]$$

$$= [5(4) + \frac{3(4)^2}{2} + \frac{4(4)^3}{3}] - [5(2) + \frac{3(2)^2}{2} + \frac{4(2)^3}{3}]$$

$$= (20 + 24 + \frac{256}{3}) - (10 + 6 + \frac{32}{3})$$

$$= 27 - 17$$

$$= 10$$

①

b) $\int_0^{\pi/2} (2\sin 3x + 3\cos 2x) dx$



$$= \left[-\frac{2}{3} \cos 3x + \frac{3}{2} \sin 2x \right]_0^{\pi/2}$$

$$= \left[-\frac{2}{3} \cos 3(\pi/2) + \frac{3}{2} \sin 2(\pi/2) \right] - \left[-\frac{2}{3} \cos 3(0) + \frac{3}{2} \sin 2(0) \right]$$

$$= (0) - (-0.667)$$

$$= 0.667 \text{ to 3 d.p.}$$

②

③

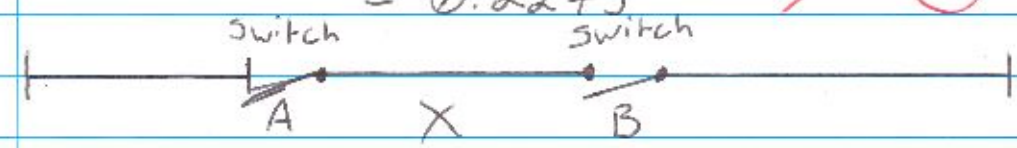
③

11

7.

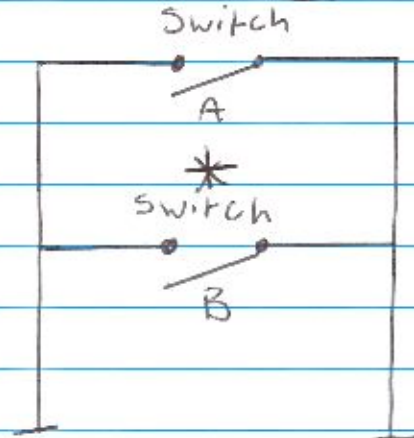
a) Probability that Both Switch A and B work in series = $P(A) \times P(B)$

$$\text{probability} = (0.35) \times (0.65)$$

$$= 0.2275$$


b) Probability that both Switch A and B work in parallel = $P(A) + P(B)$

$$\text{probability} = (0.35) + (0.65)$$

$$= 1$$


∴ This means that there will be a better chance at forming a connection when the circuit is in parallel.

②

4.

(i) in partial fractions: $\frac{6}{(s-2)(s+1)} = \frac{A}{(s-2)} + \frac{B}{(s+1)}$ (2)

(ii) and hence solve: $\int_4^5 \frac{6}{(s-2)(s+1)} ds$ (2)



PRIFYSGOL CYMRU
Y Drindod Dewi Sant
UNIVERSITY OF WALES
Trinity Saint David

Examination Answer Book

8 Pages

Instructions to candidates

1. Please give the information requested in the boxes below.
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1	Student Number	
2	Title of Examination Paper	Class Test 2
3	Module Code	PSDE 4003
4	Date and Time of Examination	28 APR 2018/ 14:30 TO 16:30
5	Examination Venue	G9
6	Seat Number	

7	Number of Answer Books handed in	1
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List the numbers of the questions you have attempted	Office Use
1(i)	5 ✓
1(ii)	7 ✓
1(iii)	8 ✓
2	6 ✓
3(A)	2 ✓
6	14 ✓
7(A)	3 ✓
7(B)	5 ✓
Total	50 ✓

(Gweler yr ochr arall am y fersiwn Cymraeg)

Please complete this section and SEAL before the examination starts.

Surname DE VLUGT Forename(s) CALUM RHY S

PATENT PENDING
INFOSAFE

1.

i) $V = 2s^4 - \frac{5}{s^2} + \sqrt{s}$

$V = 2s^4 - 5(-2s^{-3}) + s^{1/2}$

$\frac{dV}{ds} = 2(4s^3) + 10s^{-3} + \frac{1}{2}s^{-1/2}$

$= 8s^3 + 10s^{-3} + \frac{1}{2}s^{-1/2}$

(1)

(4)

ii) $y = x^3 \cdot \sin 4x$

$y = u \cdot v$

$u = x^3$

$v = \sin(4x)$

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

$\frac{dv}{dx} = 4\cos(4x)$

(4)

$\frac{dy}{dx} = u \cdot \frac{dv}{dx} + v \cdot \frac{du}{dx}$

$= x^3(4\cos(4x)) + \sin(4x) \cdot 3x^2$

(3)

(iii) $i = 3\sin(2t+4)$

$u = 2t+4$

$i = 3\sin u$

$\frac{du}{dt} = 2$

$\frac{di}{du} = 3\cos u$

(4)

$\frac{di}{dt} = \frac{di}{du} \cdot \frac{du}{dt}$

(2)

$= 3\cos u \cdot 2$

~~$= 6\cos$~~

$= 6\cos(2t+4)$

(2)

(20)

2) IF $V = 4(2 - e^{-10t})$, $\frac{dV}{dt} = 4(0 - (-10)e^{-10t})$

$= 4(10e^{-10t})$
 $= 40e^{-10t}$

When $t = 0$, $\frac{dV}{dt} = 40e^{-10(0)}$
 $= 40e^0$
 $= 40(1)$
 $= 40$

3a) $\int_2^4 (5 + 3t + 4t^2) dt$

$= \left[5t + \frac{3t^2}{2} + \frac{4t^3}{3} \right]_2^4$

$= \left[5t + 1.5t^2 + 1.3t^3 \right]_2^4$

$= (5 \times 4) + (1.5 \times 4^2) + (1.3 \times 4^3) - (5 \times 2) + (1.5 \times 2^2) + (1.3 \times 2^3)$

$= (20 + 36 + 140.608) - (10 + 9 + 17.576)$

$= 196.608 - 36.576$

$= 160.032$

6) Equations needed:

mean $\bar{x} = \frac{\sum Fx}{\sum F}$

Standard deviation $= \sqrt{\frac{\sum F(x - \bar{x})^2}{\sum F}}$

Time (s)	Frequency (F)	mid-point (x)	F x x	(x - $\bar{x}$)	(x - $\bar{x}$) ²	F(x - $\bar{x}$) ²
0-5	11	2.5	11 x 2.5 = 27.5	2.5 - 12.15 = -9.65	(-9.65) ² = 93.1225	11 x 93.1225 = 1024.3475
5-10	25	7.5	25 x 7.5 = 187.5	7.5 - 12.15 = -4.65	(-4.65) ² = 21.6225	25 x 21.6225 = 540.5625
10-15	33	12.5	33 x 12.5 = 412.5	12.5 - 12.15 = 0.35	(0.35) ² = 0.1225	33 x 0.1225 = 4.0425
15-20	22	17.5	22 x 17.5 = 385	17.5 - 12.15 = 5.35	(5.35) ² = 28.6225	22 x 28.6225 = 629.695
20-25	9	22.5	9 x 22.5 = 202.5	22.5 - 12.15 = 10.35	(10.35) ² = 107.1225	9 x 107.1225 = 964.1025
$\sum F = 100$			$\sum Fx = 1215$			$\sum F(x - \bar{x})^2 = 3162.78$

mean $\bar{x} = \frac{\sum Fx}{\sum F}$

$= \frac{1215}{100}$

$= 12.15$

standard deviation $= \sqrt{\frac{\sum F(x - \bar{x})^2}{\sum F}}$

$= \sqrt{\frac{3162.78}{100}}$

$= 5.623833212$

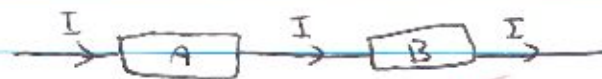
$= 5.6238$ (4dp)

$= 5.624$ (3dp)

7. $P(A) = P(A \text{ works}) = 0.35$ ✓

$P(B) = P(B \text{ works}) = 0.65$ ✓

Series



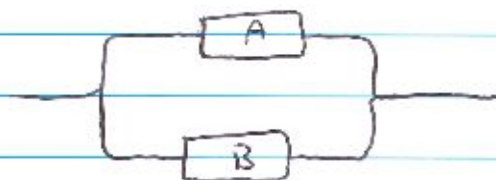
$P(\text{connection}) = P(A) \times P(B)$

$= 0.35 \times 0.65$ ✓

$= \underline{0.2275}$ (4dp) ✓

3

Parallel



$P(\text{connection}) = P(A \text{ and } B) + P(\bar{A} \text{ and } \bar{B}) + P(A \text{ and } \bar{B})$ ✓

$= (0.35 \times 0.65) + (0.75 \times 0.75) + (0.75 \times 0.25)$ ✓

$= (0.2275) + (0.5625) + (0.1875)$ ✓

$= \underline{0.9775}$ ✓

$= (0.35 \times 0.65) + (0.65 \times 0.65) + (0.35 \times 0.35)$ ✓

$= (0.2275) + (0.4225) + (0.1225)$ ✓

$= \underline{0.7725}$ ✓

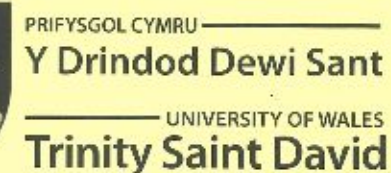
5

(CHECK $= 1 - (P(A) \times P(B))$ ✓

$= 1 - (0.2275)$ ✓

$= \underline{0.7725}$ ✓

8



8 Pages

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2	Title of Examination Paper	Class Test 2
3	Module Code	PSDE 4003
4	Date and Time of Examination	14:30 to 16:30 23/04/2018
5	Examination Venue	G9
6	Seat Number	
7	Number of Answer Books handed in	1

[illegible]

Please complete this section and SEAL before the examination starts.

mination starts.

(First Name) Forename(s)

Surname PHILLIPS

PATENT PENDING

(Gweler yr ochr arall am y fersiwn Cymraeg)

1. Differentiate the following functions:

i. $V = 2s^4 - \frac{s}{2} + \sqrt{s}$

~~$\frac{dV}{ds} = 8s^3 - \frac{1}{2} + \frac{1}{2\sqrt{s}}$~~

~~$\frac{dV}{ds} = 8s^3 - \frac{1}{2} + \frac{1}{2\sqrt{s}}$~~

~~$\frac{dV}{ds} = 8s^3 - \frac{1}{2} + \frac{1}{2\sqrt{s}}$~~

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$\frac{dV}{ds} = 8s^3 - \frac{1}{2} + \frac{1}{2\sqrt{s}}$

$\frac{dV}{ds} = 8s^3 - \frac{1}{2} + \frac{1}{2\sqrt{s}}$

(1)

ii. $y = x^3 \sin 4x$

$u = x^3$ $v = \sin 4x$

$\frac{du}{dx} = 3x^2$ $\frac{dv}{dx} = 4 \cos 4x$

$\frac{dy}{dx} = 3x^2 \sin 4x + x^3 \cdot 4 \cos 4x$

$\frac{dy}{dx} = 3x^2 \sin 4x + 4x^3 \cos 4x$

(4)

(3)

(1)

iii. $i = 3 \sin(2t + 4)$

~~$u = 2t + 4$~~

~~$v = 3 \sin u$~~

$i = 3 \sin u$

~~$\frac{du}{dt} = 2$~~

~~$\frac{dv}{du} = 3 \cos u$~~

(3)

$\frac{di}{dt} = 2 \times 3 \cos u = 6 \cos(2t + 4)$

(2)

(6)

2. If $V = 4(2 - e^{-10t})$ find the initial rate of growth of Voltage.

$u = 4y$

$y = 2 - e^{-10t}$

$\frac{du}{dy} = 4$

$\frac{dy}{dt} = -(-10)e^{-10t} = 10e^{-10t}$

$\frac{du}{dt} = 4 \times 10e^{-10t} = 40e^{-10t}$

$\frac{du}{dt} = 40e^{-10t}$

(2)

3. Evaluate the following Integrals:

a) $\int_2^4 (5 + 3t + 4t^2) dt$

~~$\int_2^4 (5 + 3t + 4t^2) dt$~~

~~$\int_2^4 (5 + 3t + 4t^2) dt$~~

~~$\int_2^4 (5 + 3t + 4t^2) dt$~~

(2)

4. fx

6. Time (s)	(2.5)	(7.5)	(12.5)	(17.5)	(22.5)
	0-5	5-10	10-15	15-20	20-25
Frequency	11	25	33	22	9

$$\cancel{(2.5 \times 11) + (7.5 \times 25) + (12.5 \times 33) + (17.5 \times 22) + (22.5 \times 9) = 1215/100}$$

$$\cancel{\text{mean} = 12.15 \text{ seconds}}$$

$$(2.5 \times 11) + (7.5 \times 25) + (12.5 \times 33) + (17.5 \times 22) + 22.5 \times 9 = 1215/100$$

$$\text{mean} = 12.15 \text{ seconds}$$

5

5