edexcel

Mark Scheme (Results)

Summer 2014

Pearson Edexcel
GCSE in Principal Learning
Engineering EG308 01
(Paper 01: Mathematical
Techniques)

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2014
Publications Code DP038650

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark	
1 (a)(i)	$3v = 4\pi r^3$ $\frac{3v}{4\pi} = r^3$ $r = \sqrt[3]{\frac{3v}{4\pi}}$ Seen $\sqrt[3]{\frac{v}{\frac{4\pi}{3}}}$ This also works at the final stage for the third mark	**(3)**	**1** **1** **1**

Question Number	Answer	Mark	
1(a)(ii)	$r = \sqrt[3]{\frac{3v}{4\pi}}$ $r = \sqrt[3]{\frac{3\times 2144}{4\pi}}$ $r = \sqrt[3]{\frac{6432}{4\pi}}$ $r = \sqrt[3]{511.8}$ $r = 7.99$ $r = 8$ Allow follow through.	**(1)**	**1**

Question Number	Answer	Mark	
1(b)	$4\log x + \log 4 = 3\log 4$ $\log x^4 + \log 4 = \log 4^3$ $\log x^4 = \log 64 - \log 4$ $\log x^4 = \log \frac{64}{4}$ $\log x^4 = \log 16$ $x^4 = 16$ $x = \sqrt[4]{16}$ $x = 2$ Note If solved by calculator, award 1 mark only	**(3)**	**1** **1** **1**

Question Number	Answer	Mark	
1(c)	$\frac{9.5}{10} = 1 - e^{-40t}$ $1 - 0.95 = e^{-40t}$ $0.05 = e^{-40t}$ $\ln 0.05 = -40t$ $\frac{-2.996}{-40} = t$ $t = 0.075$	**(3)**	**1** **1** **1**

Question Number	Answer	Mark	
2(a)(i)	$\text{Slope} = \frac{60-42}{100-50} = 0.36$ Other selected points on the graph can give acceptable values At $R = 60 = 0.36 \times 100 + C$ $60 = 36 + C$ C = 24 = intercept Law $R = 0.36t + 24$	**(3)**	**1** **1** **1**

Question Number	Answer	Mark	
2(a)(ii)	Law $R = 0.36t + 24$ $R = 0.36 \times 12.5 + 24$ $R = 28.5$ Allow follow through	**(1)**	**1**

Question Number	Answer	Mark	
2(b)	$Q = 1.5t^2 + 4t$ $1.5t^2 + 4t - 55 = 0$ $t = \frac{-4 \pm \sqrt{4^2 - (4 \times 1.5 \times -55)}}{2 \times 1.5}$ $t = \frac{-4 \pm \sqrt{346}}{3}$ $t = \frac{-4 \pm 18.6}{3}$ $t = -7.53$ and $t = 4.87$ so $t = 4.87$ s	**(4)**	**1** **1** **1** **1**

Question Number	Answer	Mark	
2(c)	$\pi r^2\left(\frac{1}{3}h+\frac{2}{3}r\right)$ Becomes $\frac{1}{3}\pi r^2(h+2r)$ 1 mark only for partial factorisation	**(2)**	**1** **1**

Question Number	Answer	Mark	
3 (a)	$a^2 = b^2 + c^2 - 2ab\cos A$ 1 mark for angle $53°$ from drawing $a^2 = 12^2 + 3.5^2 - 2\times 12\times 3.5\times \cos 53$ $a^2 = 144 + 12.25 - (84\times \cos 53)$ $a^2 = 156 - 50.55$ $a^2 = 105.7$ $a = \sqrt{105.7}$ $a = 10.28$ m	**(4)**	**1** **1** **1** **1**

Question Number	Answer		Mark	
3(b)	$\sin 35 = \frac{h}{360}$ $h = 360\times \sin 35$ $h = 206.49$ mm	Also by sine rule $\frac{360}{\sin 90} = \frac{h}{\sin 35}$ h = (sin 35 x 360)/sin 90 h = 206.49	**(3)**	**1** **1** **1**

Question Number	Answer	Mark	
3(c)	$40\times 2\pi = 251.32$ (1 for $\times$ by 2π) $251.32 \div 60 = 4.2$ rad s^{-1} (1 for ÷ by 60)	**(2)**	**1** **1**

Question Number	Answer	Mark	
4(a)	Vol of cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times 10^2 \times 20$		**1**
	$= 2094.4$		**1**
	Vol of cyl $= \pi r^2 h = \pi \times 10^2 \times 30$		**1**
	$= 9424.78$		**1**
	Total volume $= 2094.4 + 9424.78 = 11519.2 \text{ mm}^3$		**1**
	Accept answers with different values of π	**(5)**	

Question Number	Answer	Mark	
4(b)	Surface area $= 4\pi r^2$		
	$= 4 \times \pi \times 25^2$		
	$= 7853.98 \text{mm}^2$		**1**
	Accept rounded values (7854)		**1**
	Accept answers with different values of π i.e 3.14 gives 7850	**(2)**	

Question Number	Answer	Mark	
4(c)	$a = 2$		**1**
	$b = 1$		**1**
		(2)	

Question Number	Answer	Mark	
5(a)(i)	The most common occurring (or similar)		**1**
(ii)	12 mm	**(2)**	**1**

Question Number	Answer	Mark	
5(b)(i)	The middle value when placed in numerical order (or similar)		
(ii)	Do not accept *middle value*, unless evidence in (ii) shows the values in numerical order		**1**
	6,6,6,6,6,6,8,8,8,8,8,10,10,10,10,10,10, 12,12,12,12,12,12,12,16,16,16,16,20,20,20,24, 24		**1**
	10 mm		**1**
	can also be determined from $\frac{(n+1)}{2} = 17^{th}$ number		
	= 10mm	**(3)**	

Question Number	Answer	Mark	
5(c)	$(6\times6)+(8\times5)+(10\times6)+(12\times7)+(16\times4)+(20\times3)$ $+(24\times2)=392$		**1**
	6+5+6+7+4+3+2=33		**1**
	$\frac{392}{33}$		
	= 11.88 mm	**(3)**	**1**

Question Number	Answer	Mark	
5(d)	There would be 3 mode values The modes would be 6, 10 and 12 Or there would be more than one modal value Or similar statements that confirm the new mode state	**(1)**	**1**

Question Number	Answer	Mark	
6(a)	$\frac{dv}{dt} = 40 - 6t$ $40 - 18 = 22 \text{ ms}^{-2}$	**(3)**	**2** **1**

Question Number	Answer	Mark	
6(b)	$0 = 40 - 6t$ $40 = 6t$ $t = 6.67 \text{ s}$	**(3)**	**1** **1** **1**

Question Number	Answer	Mark	
6(c)	$v = 30 + 40t - 3t^2$ $= 30 + (40 \times 6.67) - (3 \times 6.67^2)$ $= 30 + 266.8 - 133.5$ $= 163.3 \text{ ms}^{-1}$ Allow follow through up to 1 mark	**(2)**	**1** **1**

Question Number	Answer	Mark	
6(d)	$30 + 40t - 3t^2$ $\int_2^4 \left(30 + 40t - 3t^2\right) dt$ $= \left[30t + \frac{40t^2}{2} - \frac{3t^3}{3}\right]_2^4$ $= \left[30t + 20t^2 - t^3\right]_2^4$ $= (120 + 320 - 64) - (60 + 80 - 8)$ $= 376 - 132$ $= 244 \text{ m}$	**(5)**	 **3** **1** **1**

Note on 6(d) but not to be shown on ms. The 3 marks above are 1 for each correct integration that stage.

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE