

**B.ENG. AND M.ENG. EXAMINATIONS 2012**

**PART I : MATHEMATICS 2 (ELECTRICAL AND INFORMATION  
SYSTEMS ENGINEERING)**

**Date Friday 8th June 2012 10.00 - 12.00**

*DO NOT OPEN THIS PAPER UNTIL THE INVIGILATOR TELLS YOU TO*

**Answer Question 1 and THREE of the remaining FIVE questions.**

**Answer Section A and Section B in different answerbooks.**

Question 1 carries twice the marks of each of the other questions.

**CALCULATORS MAY NOT BE USED.**

*A mathematical formulae sheet is provided.*

*[Before starting, please make sure that the paper is complete; there should be 6 pages, with a total of SIX questions. Ask the invigilator for a replacement if your copy is faulty.]*

**SECTION A**

1. (i) Find the angle between the vectors  $\mathbf{a} = (1, 2, 3)$ ,  $\mathbf{b} = (2, 0, 4)$ .

- (ii) Find the value of the constant  $\lambda$ , such that

$$(y \cos x + \lambda \cos y) dx + (x \sin y + \sin x + y) dy$$

is the exact differential of a function  $f(x, y)$ . Find the corresponding function  $f(x, y)$  subject to  $f(0, 1) = 0$ .

- (iii) If the universal set  $\Omega$  is the set of all positive integers less than or equal to 32 and

$$A = \{N \in \Omega : 1 \leq N \leq 10\}$$

$$B = \{N \in \Omega : N \text{ even and } N \leq 20\}$$

find:

$$(a) \overline{A}, \quad (b) \overline{A \cup B}, \quad (c) \overline{A \cap B}, \quad (d) \overline{A \cap B}.$$

- (iv) If  $V = \ln(x^2 + y^2)$ , prove that

$$\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} = 0.$$

- (v) For what values of  $k$  are the equations

$$\begin{aligned} x + y - k &= 0, \\ kx - 3y + 11 &= 0, \\ 2x + 4y - 8 &= 0, \end{aligned}$$

consistent?

- (vi) By means of a 'truth' table show that  $p \rightarrow q$  and  $\bar{q} \rightarrow \bar{p}$  are equivalent.

**Q1 CONTINUES ON THE NEXT PAGE**

- (vii) Define what is meant by an even and an odd function of  $x$ .

A function of  $x$ ,  $f(x)$ , is periodic with period  $2\pi$  and satisfies

$$f(x) = \begin{cases} -1, & -\pi < x < 0, \\ 1, & 0 < x < \pi. \end{cases}$$

Sketch the function and find its Fourier series.

- (viii) Find the perpendicular distance from the origin to the plane through the points

$$(1, 1, 1), \quad (2, 2, 3), \quad (1, 3, 4).$$

- (ix) Obtain the Taylor series expansion of the function  $f = \sin(xy)$  about the point  $(x, y) = (1, \pi/3)$  neglecting terms of degree three and higher.

- (x) Find the inverse of the matrix  $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 1 & 5 \\ 6 & 0 & 2 \end{pmatrix}$ .

## SECTION B

2. Find the dimensions of a rectangular box of maximum capacity given the box has

no top and has surface area  $108\text{m}^2$ .

3. The function  $f(x)$  is defined by

$$f(x) = \begin{cases} -x, & -\pi < x \leq 0 \\ 0, & 0 < x < \pi \end{cases}$$

and  $f(x + 2\pi) = f(x)$ .

- (i) Sketch the function in the range  $-2\pi \leq x \leq 2\pi$ .

- (ii) Show that the Fourier series of  $f(x)$  is

$$f(x) = \frac{\pi}{4} - \frac{2}{\pi} \sum_{m=0}^{\infty} \frac{\cos(2m+1)x}{(2m+1)^2} + \sum_{m=1}^{\infty} \frac{(-1)^n \sin nx}{n}.$$

What does the Fourier series converge to at  $x = \pm\pi$ ?

- (iii) By suitable choice of  $x$  evaluate

(a)  $\sum_{m=0}^{\infty} \frac{(-1)^m}{2m+1}.$

(b)  $\sum_{m=0}^{\infty} \frac{1}{(2m+1)^2}.$

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4.  $u = x^n f(z)$  when  $f$  is any differentiable function of  $z = y/x$  and  $n$  is a constant.

(i) Show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = nu$ . (1)

(ii) Hence show that  $x \frac{\partial^2 u}{\partial x^2} + (x + y) \frac{\partial^2 u}{\partial x \partial y} + y \frac{\partial^2 u}{\partial y^2} = (n - 1) \left( \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} \right)$ .

(iii) Verify the result (ii) for  $n = 2$ ,  $f(z) = z$ .

(iv) By writing (1) in the form

$$\left( x \frac{\partial}{\partial x} + y \frac{\partial}{\partial y} \right) u = nu$$

or otherwise show also that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = n^2 u.$$

5. Find a unit vector in the same direction as the vector  $\mathbf{a} = 4\mathbf{i} - 2\mathbf{j} + 4\mathbf{k}$  and another unit vector in the same direction as  $\mathbf{b} = -4\mathbf{i} + 3\mathbf{k}$ .

(i) Show that the sum of these unit vectors bisects the angle between  $\mathbf{a}$  and  $\mathbf{b}$ .

(ii) Find a unit vector  $\hat{\mathbf{t}}$  which is normal to  $\mathbf{a}$  and  $\mathbf{b}$ .

(iii) Finally find the volume of the parallelepiped whose edges correspond to the three unit vectors defined above.

6. (i) Use Mathematical Induction to show that

$$1 + 2 + 3 + \dots + N = \frac{1}{2} N(N+1) ,$$

for any natural number  $N$ .

- (ii) Let  $A$ ,  $B$  and  $C$  be the following propositions:

$A$  : it is raining ;

$B$  : the sun is shining ;

$C$  : there are clouds in the sky .

- (a) Translate the following English sentences into logical expressions :

i If it is raining then there are clouds in the sky ;

ii If there are no clouds in the sky then the sun is shining .

- (b) Translate the following logical expressions into English sentences :

i  $(A \cap B) \rightarrow C$  ;

ii  $\overline{A} \rightarrow (B \cup C)$  .

- (iii) State the truth table for  $(A \rightarrow B) \cup (B \rightarrow A)$ ,  $(A \rightarrow B) \cap (B \rightarrow A)$  and  $(A \leftrightarrow B)$ .

Which two of these three logical expressions are equivalent ?

**END OF PAPER**

	EXAMINATION <del>QUESTIONS</del> /SOLUTIONS 2011-2012	Course  EEI
Question 1	TOPIC	Marks & seen/unseen
Parts	<p>a) By definition of dot product <math>\underline{a} \cdot \underline{b} =  \underline{a}   \underline{b}  \cos \theta</math>  <math>= a_1 b_1 + a_2 b_2 + a_3 b_3</math>  <math> \underline{a}  = \sqrt{1^2 + 2^2 + 3^2} = \sqrt{14}</math>, <math> \underline{b}  = \sqrt{4 + 16} = \sqrt{20}</math>  <math>\therefore \underline{a} \cdot \underline{b} = 2 + 0 + 12 = \sqrt{14} \sqrt{20} \cos \theta</math>  <math>\theta = \cos^{-1} \sqrt{\frac{7}{10}}</math></p> <p>b) Krait of <math>\frac{\partial}{\partial y} (y \cos x + \lambda \cos y) = \frac{\partial}{\partial x} (x \sin y + \sin x + y)</math>  <math>\therefore \cos x - \lambda \sin y = \sin y + \cos x</math>  <math>\therefore \lambda = -1</math></p> <p><math>\frac{\partial}{\partial x} = y \cos x + \lambda \cos y \Rightarrow f = y \sin x - x \cos y + A(y)</math>  <math>\text{Let } \frac{\partial}{\partial y} = \sin x + x \sin y = x \sin y + \sin x + y</math>  <math>\therefore A = y^2/2 + \text{constant}</math>  <math>\therefore f = y \sin x - x \cos y + y^2/2 + \text{constant}</math>  <math>\therefore f(0,1) = 0 \Rightarrow \text{constant} = -1/2</math>  <math>f = y \sin x - x \cos y + \frac{1}{2}(y^2 - 1)</math></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
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	EXAMINATION QUESTIONS/SOLUTIONS 2011-2012	Course EEI(2)
Question 1	TOPIC	Marks & seen/unseen
Parts	<p>c) a) <math>\{n \in \mathbb{N}, 11 \leq n \leq 32\}</math>, b) <math>\{11, 13, 15, 17, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32\}</math></p> <p>c) <math>(\bar{A} \cap \bar{B}) = \{11, 13, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32\}</math></p> <p>d) <math>\overline{A \cap B} = \{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32\}</math>  <math>A \cap B = \{2, 4, 6, 8, 10\}</math></p> <p>e) <del><math>\overline{A \cup B} = A \cap B</math></del></p> <p>d.</p> $\frac{\partial V}{\partial x} = \frac{2x}{x^2 + y^2} \quad \frac{\partial V}{\partial x^2} = \frac{(x^2 + y^2)2 - 2x \cdot 2x}{(x^2 + y^2)^2} = \frac{2(y^2 - x^2)}{(x^2 + y^2)^2}$ <p>Similarly <math>\frac{\partial V}{\partial y^2} = \frac{2(x^2 - y^2)}{(x^2 + y^2)^2}</math></p> $\therefore \frac{\partial V}{\partial x^2} + \frac{\partial V}{\partial y^2} = 0$ <p>e.</p> <p>Require <math>\begin{vmatrix} 1 &amp; 1 &amp; -k \\ k &amp; -3 &amp; 11 \\ 2 &amp; 4 &amp; -8 \end{vmatrix} = 0</math></p> $\therefore \begin{vmatrix} -3 & 11 \\ 4 & -8 \end{vmatrix} - \begin{vmatrix} k & 11 \\ 2 & -8 \end{vmatrix} - k \begin{vmatrix} k & -3 \\ 2 & 4 \end{vmatrix} = 0$ $\therefore -4k^2 + 2k + 2 = 0$ $k = 1, -1/2$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
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# EXAMINATION QUESTIONS/SOLUTIONS 2011-2012

Course

EEI(2)

Question

1

TOPIC

Marks &

seen/unseen

Parts

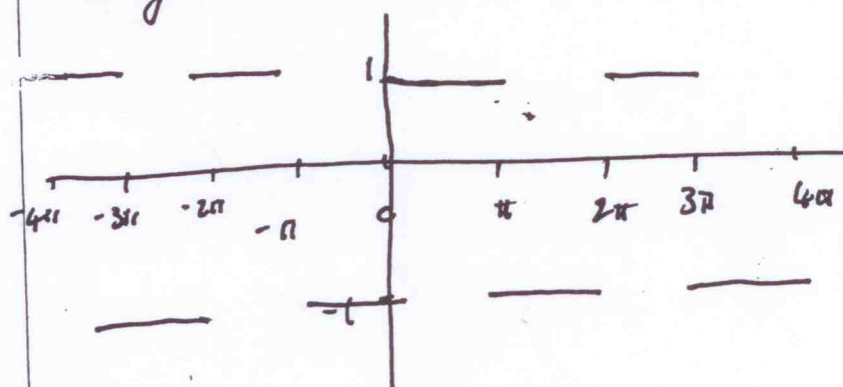
f

$p$	$q$	$\bar{p}$	$\bar{q}$	$p \rightarrow q$	$\bar{q} \rightarrow \bar{p}$
T	T	F	F	T	T
T	F	F	T	F	F
F	T	T	F	T	T
F	F	T	T	T	T

1 mark  
for each of  
columns 3-6

4

g. Given  $f(x) = f(-x)$ , odd if  $f(x) = -f(-x)$ .



$$f = \sum_{n=1}^{\infty} b_n \sin nx.$$

$$b_n = \frac{2}{\pi} \int_0^{\pi} f(x) \sin nx \, dx = \frac{2}{\pi} \left[ -\frac{1}{n} \cos nx \right]_0^{\pi}$$

$$= \frac{2}{\pi} (1 - (-1)^n) = \frac{4}{n\pi}, n \text{ odd}$$

$$= 0, n \text{ even}$$

$$\therefore f = \frac{4}{\pi} \sum_{n=1}^{\infty} \frac{\sin(2n-1)x}{2n-1}$$

EXAMINATION QUESTIONS/SOLUTIONS 2011-2012		Course
		EEI(2)
Question 1	TOPIC	Marks & seen/unseen
Parts hr	<p>Let <math>\underline{a} = (2, 2, 3) - (1, 1, 1) = (1, 1, 2)</math>  <math>\underline{b} = (1, 3, 4) - (1, 1, 1) = (0, 2, 3)</math>            Normal to plane <math>\propto \underline{a} \wedge \underline{b} = (-1, -3, 2)</math>  <math>\therefore</math> Equation of plane <math>\propto</math>  <math>(\underline{r} - (1, 1, 1)) \cdot (-1, -3, 2) = 0</math>  <math>\therefore -x - 3y + 2z = -2</math>  <math>\therefore \frac{x + 3y - 2z}{\sqrt{14}} = \frac{2}{\sqrt{14}}</math>  <math>\therefore</math> Distance from origin <math>= \frac{2}{\sqrt{14}}</math></p> <p>i</p> <p> <math>f_x = y \cos xy</math>, at <math>(1, \pi/3) = \pi/6</math>.  <math>f_y = x \cos xy</math>, at <math>(1, \pi/3) = 1/2</math>.  <math>f_{xx} = -y^2 \sin xy</math>, at <math>(1, \pi/3) = -\frac{\pi^2 \sqrt{3}}{18}</math>.  <math>f_{xy} = \cos xy - xy \sin xy</math>, at <math>(1, \pi/3) = \frac{1}{2} - \frac{\pi \sqrt{3}}{6}</math>.  <math>f_{yy} = -x^2 \sin xy</math>, at <math>(1, \pi/3) = -\frac{1}{2} \sqrt{3}</math>.           </p> <p><math>\therefore</math> Neglecting terms of cubic order</p> <p> <math>\sin xy = \frac{\sqrt{3}}{2} + \frac{\pi}{6}(x-1) + \frac{1}{2}(y-\pi/3) - \frac{\pi^2 \sqrt{3}}{36}(x-1)^2</math>  <math>+ (\frac{1}{2} - \frac{\pi \sqrt{3}}{6})(x-1)(y-\pi/3) - \frac{\sqrt{3}}{4}(y-\pi/3)^2</math> </p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p>
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EXAMINATION QUESTIONS/SOLUTIONS 2011-2012		Course
		EE1 (2)
Question	TOPIC	Marks & seen/unseen
1		
Parts j	$ A  = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 1 & 5 \\ 6 & 0 & 2 \end{vmatrix} = 2 - 2(-22) + 3(-6) = 28$ <p>Matrix of cofactors <math>C = \begin{vmatrix} A_{11} &amp; A_{12} &amp; A_{13} \\ A_{21} &amp; A_{22} &amp; A_{23} \\ A_{31} &amp; A_{32} &amp; A_{33} \end{vmatrix}</math></p> <p>with <math>A_{11} = 2, A_{12} = 22, A_{13} = -6</math>  <math>A_{21} = -4, A_{22} = -16, A_{23} = 12</math>  <math>A_{31} = 7, A_{32} = 7, A_{33} = -7</math></p> $\therefore \text{adj } A = \begin{pmatrix} 2 & -4 & 7 \\ 22 & -16 & 7 \\ -6 & 12 & -7 \end{pmatrix}$ $A^{-1} = \frac{1}{28} \begin{pmatrix} 2 & -4 & 7 \\ 22 & -16 & 7 \\ -6 & 12 & -7 \end{pmatrix}$	<p>1</p> <p>2</p> <p>1</p>
Setter's initials		Page number

	EXAMINATION QUESTIONS/SOLUTIONS 2011-2012	Course EE I (2)
Question 2.	TOPIC	Marks & seen/unseen
Parts	<p>c If dimensions of box are <math>x, y, z</math> then require maximum of <math>xyz</math> subject to</p> $xy + 2xz + 2yz = 108 \quad (1)$ <p>Auxiliary function is <math>\phi = xyz + \lambda(xy + 2xz + 2yz) - \lambda \cdot 108</math></p> <p><math>\therefore</math> require</p> $\phi_x = yz + \lambda(y + 2z) = 0 \quad (2)$ $\phi_y = xz + \lambda(x + 2z) = 0 \quad (3)$ $\phi_z = xy + \lambda(2x + 2y) = 0 \quad (4)$ <p>Now solve (1), (2), (3), (4).</p> $(2)(3) + (y)(3) + (z)(4) \text{ gives } 3xyz + \lambda(2xy + 4xz + 4yz) = 0$ $\therefore \lambda(2xy + 2xz + 2yz) + \frac{3}{2}xyz = 0$ $\therefore 108\lambda + \frac{3}{2}xyz = 0 \Rightarrow \lambda = \frac{-xyz}{72}$ $\therefore 1 - \frac{\lambda}{72}(y + 2z) = 0$ $1 - \frac{\lambda}{72}(x + 2z) = 0$ $1 - \frac{\lambda}{72}(2x + 2y) = 0$ $\therefore \frac{yz}{36} - \frac{z^2}{36} = 0 \Rightarrow z = y \quad (z \neq 0)$ $\therefore 1 - \frac{yz}{18} = 0 \Rightarrow yz = 18$ $1 - \frac{y^2}{18} - \frac{1}{2} = 0 \Rightarrow y^2 = 36, y = 6$	<p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>4</p> <p>2</p>
	Setter's initials 72	Checker's initials 56
		Page number

	EXAMINATION <del>QUESTIONS</del> /SOLUTIONS 2011-2012	Course EE I (2)
Question 2	TOPIC	Marks & seen/unseen
Parts	$\therefore x = 6, y = 6, z = 3$ From physical considerations follows that $z$ is a maximum.	2
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Question

3

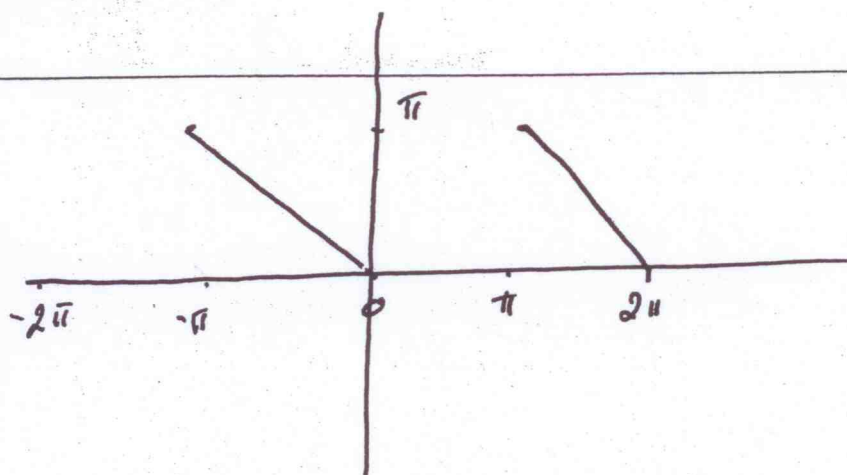
TOPIC

Marks &amp;

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Parts

a)



2

b)

$$\text{Let } f(x) = \frac{1}{2}A_0 + \sum_{n=1}^{\infty} A_n \cos nx + \sum_{n=1}^{\infty} B_n \sin nx$$

$$A_0 = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) dx = \frac{1}{\pi} \int_{-\pi}^0 2 dx = \frac{1}{\pi} \left[ \frac{x^2}{2} \right]_{-\pi}^0 = \pi/2$$

$$A_n = \frac{1}{\pi} \int_{-\pi}^0 (-2) \cos nx dx = \frac{1}{\pi} \left\{ \left[ -\frac{x \sin nx}{n} \right]_{-\pi}^0 + \int_{-\pi}^0 \frac{\sin nx}{n} dx \right\}$$

$$= \frac{-1}{n^2 \pi} \left[ \cos nx \right]_{-\pi}^0$$

$$= \frac{-1}{n^2 \pi} (1 - (-1)^n) = \frac{-2}{n^2 \pi}, \text{ n odd}$$

$$= 0, \text{ n even}$$

$$B_n = \frac{1}{\pi} \int_{-\pi}^0 (-x) \sin nx dx = \frac{1}{\pi} \left[ \frac{x \cos nx}{n} - \frac{1}{n^2} \sin nx \right]_{-\pi}^0$$

$$= (-1)^n / n$$

$$\therefore f = \pi/4 - \frac{2}{\pi} \sum_{n=0}^{\infty} \frac{\cos(2n+1)x}{(2n+1)^2} + \sum_{n=1}^{\infty} \frac{(-1)^n \sin nx}{n}$$

# EXAMINATION QUESTIONS/SOLUTIONS 2011-2012

Course

EEI  
(2)

Question

3

TOPIC

Marks &

seen/unseen

Parts

$$f\left(\frac{\pi}{2}\right) = \frac{1}{2} \left( \lim_{x \rightarrow \frac{\pi}{2}^+} f(x) + \lim_{x \rightarrow \frac{\pi}{2}^-} f(x) \right) = \frac{\pi}{2}$$

c) Now put  $x = \frac{\pi}{2}$ , since  $\cos(2m+1)\frac{\pi}{2} = 0$

$$\therefore 0 = \frac{\pi}{4} + \sum_{m=1}^{\infty} \frac{(-1)^m}{m} \sin m \frac{\pi}{2} = \frac{\pi}{4} + \sum_{m=0}^{\infty} \frac{(-1)^{2m+1} (-1)^m}{2m+1}$$

$$\therefore \sum_{m=0}^{\infty} \frac{(-1)^m}{2m+1} = \frac{\pi}{4}$$

Now put  $x = 0$ ,

and  $0 = \frac{\pi}{4} - \frac{2}{\pi} \sum_{m=0}^{\infty} \frac{1}{(2m+1)^2}$

$$\therefore \sum_{m=0}^{\infty} \frac{1}{(2m+1)^2} = \frac{\pi^2}{8}$$





	EXAMINATION <del>QUESTIONS</del> /SOLUTIONS 2011-2012	Course EEI (2)
Question 4	TOPIC	Marks & seen/unseen
Parts	$\therefore x \left\{ \frac{\partial u}{\partial x} + x \frac{\partial^2 u}{\partial x^2} + y \frac{\partial^2 u}{\partial x \partial y} \right\} + y \left\{ x \frac{\partial^2 u}{\partial y \partial x} + \frac{\partial u}{\partial y} + y \frac{\partial^2 u}{\partial y^2} \right\}$ $= h^2 u$ $u \left( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} \right) = h^2 u$	2
	Setter's initials <i>HC</i>	Page number

	EXAMINATION QUESTIONS/SOLUTIONS 2011-2012	Course EE I (2)
Question 5	TOPIC	Marks & seen/unseen
Parts (i)	$\underline{\hat{a}} = (4, -2, 4) / \sqrt{16+4+16}$ $= (2/3, -1/3, 2/3)$ $\underline{\hat{b}} = (-4, 0, 3) / \sqrt{16+9}$ $= (-4/5, 0, 3/5)$ $\underline{u} = \underline{\hat{a}} + \underline{\hat{b}} = \frac{1}{15}(-2, -5, 19)$ $\underline{u} \cdot \underline{\hat{a}} = \frac{1}{45}(-4+5+38) = \frac{39}{45} - \frac{13}{15} = 1/5 \omega_1$ $\underline{u} \cdot \underline{\hat{b}} = \frac{1}{75}(8+57) = \frac{13}{15} = 1/5 \omega_2$ <p><math>\therefore \omega_1 = \omega_2</math> so <math>\underline{u}</math> bisects <math>\underline{\hat{a}}, \underline{\hat{b}}</math>.</p> <p>(ii) Now let <math>\underline{\hat{c}} = \underline{\hat{a}} \wedge \underline{\hat{b}} = \begin{vmatrix} \underline{i} &amp; \underline{j} &amp; \underline{k} \\ 2 &amp; -1 &amp; 2 \\ -4 &amp; 0 &amp; 3 \end{vmatrix} / 15</math></p> $= \frac{1}{15}(-3, 14, 4)$ $\text{so } \underline{\hat{c}} = \frac{1}{\sqrt{221}}(-3, 14, 4)$ <p>(iii) <math>\therefore V =  \underline{\hat{c}} \cdot \underline{\hat{a}} \wedge \underline{\hat{b}}  = \left  \frac{1}{15 \sqrt{221}} \begin{vmatrix} -3 &amp; 14 &amp; 4 \\ 2 &amp; -1 &amp; 2 \\ -4 &amp; 0 &amp; 3 \end{vmatrix} \right </math></p> $\text{or } = \frac{\sqrt{221}}{225} = \frac{\sqrt{221}}{15}$ $\underline{\hat{k}} = \frac{15}{\sqrt{221}} \underline{\hat{a}} \wedge \underline{\hat{b}}$ $\Rightarrow 1 = \frac{15}{\sqrt{221}} V$	<p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p> <p>3</p> <p>2</p> <p>4</p>
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	EXAMINATION QUESTIONS/SOLUTIONS 2011-2012	Course EEI (2)
Question 6	TOPIC	Marks & seen/unseen
Parts 6. a	<p>Just set <math>N=1</math> to give <math>1 = \frac{1}{2}(1+1)</math> which is the proposition holds for <math>N=1</math>.</p> <p>Now assume true for <math>N=n</math> so that  <math display="block">1+2+3+\dots+n = \frac{n}{2}(n+1)</math> </p> <p>But <math>(1+2+3+\dots+n) + n+1</math>  is therefore given by <math>\frac{n}{2}(n+1) + n+1</math>  <math display="block">= \frac{(n+1)(n+2)}{2}</math> </p> <p>which is the original proposition with  <math>N</math> replaced by <math>n+1</math>. Thus since the  proposition true for <math>N=1</math> it is true for  all <math>N</math>.</p>	<p>2</p> <p>2</p> <p>4</p> <p>2</p>
	Setter's initials <i>ALL</i>	Checker's initials <i>AD</i> <i>MX</i>
		Page number

	EXAMINATION <del>QUESTIONS</del> /SOLUTIONS 2011-2012				Course EEI (2)
Question 6	TOPIC				Marks & seen/unseen
Parts 6	<p>I (i) <math>A \rightarrow C</math></p> <p>(ii) <math>\bar{C} \rightarrow B</math></p> <p>II (i) If it is raining and the sun is shining, then there are clouds in the sky</p> <p>(ii) If it is not raining, then the sun is shining or there are clouds in the sky.</p>				1  <