SRI BHARATHI

ENGINEERING COLLEGE FOR WOMEN

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)

Kaikkurichi, Pudukkottai -622 303

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NAAC DOCUMENTS

Quality Indicator Frame Work

Criterion – 2

Teaching-Learning and Evaluation

Submitted by

IQAC

Internal Quality Assurance Cell

Sri Bharathi Engineering College for Women

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Criteria 2	Teaching-Learning and Evaluation	350

Key Indicator- 2.3. Teaching- Learning Process (40)

2018-2019

SCIENCE AND HUMANITIES

PROBLEM SOLVING

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Criteria 2	Teaching-Learning and Evaluation	350

Key Indicator- 2.3. Teaching- Learning Process (40)

2018-2019

SCIENCE AND HUMANITIES

PROBLEM SOLVING

TUTORIAL

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Kaikkurichi, Pudukkottai, Tamil Nadu – 622 303, India

DEPARTMENT OF SCIENCE AND HUMANITIES
ACEDEMIC YEAR (2018-2019)-EVEN SEMESTER
PROBLEM SOLVING METHOD

SL.NO	REG.NO	NAME	YEAR/SEC	LEARNING METHOD
1.	912618104001	ABIRAMI S	I/A	
2.	912618104002	AKILA P	I/A	
3.	912618104003	BUVANESHWARI S	I/A	
4.	912618104004	EVANJELIN S	I/A	
5.	912618104005	FEFINA I	I/A	
6.	912618104006	GAYATHRI S	I/A	
7.	912618104007	GOWSALYA A	I/A	
8.	912618104008	ISHWARYA S	I/A	
9.	912618104009	ISWARYA C	I/A	
10.	912618104011	JAYANTHINI T	I/A	
11.	912618104012	KAVIYASELVI K	I/A	
12.	912618104013	KOWSALYA S	I/A	
13.	912618104014	LAKSHMI N	I/A	**PROBLEM SOLVING METHOD-TUTORIAL** **MA8351**-ENGINEERING MATHEMATICS-II
14.	912618104015	LAKSHMI PRABHA M	I/A	
15.	912618104017	MALA S	I/A	
16.	912618104018	MAMTHA G	I/A	
17.	912618104019	NIRANJANADEVI C	I/A	
18.	912618104020	NIVEDHA M	I/A	
19.	912618104021	NIVETHA G	I/A	
20.	912618104022	PRIYADHARSHINI R	I/A	
21.	912618104023	PRIYAVATHANI A	I/A	
22.	912618104024	PUVIYARASI S	I/A	
23.	912618104025	RASMI J	I/A	
24.	912618104026	ROSLINA BEGUM R	I/A	
25.	912618104027	SINDHU V	I/A	
26.	912618104028	SIVASANGAVI A	I/A	
27.	912618104029	SURUTHIKA S	I/A	
28.	912618104030	SURYA A	I/A	

Dr. S.THILAGAVATHI M.E.,Ph.D.,
PRINCIPAL
SRI BHARATHI ENGINEERING
COLLEGE FOR WOMEN
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29.	912618104031	SUSHMEENA K	I/A	
30.	912618103002	KOWSALYA.M	I/B	
31.	912618103003	MAHESHWARI V	I/B	
32.	912618103005	MEENACHI K	I/B	
33.	912618103008	SATHYA M	I/B	
34.	912618103009	SRIVIDHYA S	I/B	**PROBLEM SOLVING METHOD-TUTORIAL** **MA8351**-ENGINEERING MATHEMATICS-II
35.	912618103010	UMAMAHESWARI K	I/B	
36.	912618106001	ANUSHAA S	I/B	
37.	912618106002	ARIVARASI A	I/B	
38.	912618106003	ASMATH HAZEENA N	I/B	
39.	912618106004	ATCHAYA R	I/B	
40.	912618106005	JAYAPRIYA T	I/B	
41.	912618106006	JAYASRI M	I/B	
42.	912618106007	NAGALAKSHMI P	I/B	
43.	912618106008	NAVITHRA D	I/B	
44.	912618106009	ROHINI K	I/B	
45.	912618106010	SOUNTHARYA P	I/B	
46.	912618106011	SUBATHARANI V	I/B	
47.	912618106012	THAIYAL NAYAGI K	I/B	
48.	912618105001	AARTHI G	I/B	
49.	912618105002	AASHA R	I/B	
50.	912618105003	AGARI S	I/B	
51.	912618105004	JEEVITHA R	I/B	
52.	912618105005	NISHA K	I/B	
53.	912618105006	RAMANA R	I/B	
54.	912618105007	SNEHA S	I/B	

Name and signature of the faculty Incharge

HoD/S&H

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PUDUKKOTTAI - 622 303.

Dr. S. THILAGAVATHI M.E., Ph.D.,
PRINCIPAL
SRI BHARATHI ENGINEERING
COLLEGE FOR WOMEN
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ACADEMIC YEAR 2018 – 2019 (EVEN SEMESTER)
DEPARTMENT OF SCIENCE AND HUMANITIES

Tutorial Question Paper

Tutorial – 01			Date of Issue:	17.09.2018	Marks	10
Course code	MA8251	Course Title	Engineering mathematics-II			
Year	I	Semester/Section	I / B	Date of Submission:	19.09.2018	

Q.No	Questions	CO
1	Obtain the eigen values and eigen vectors ofthe matrix $A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$	C110.1
2	Determine a diagonal matrix orthogonally similar to the real symmetric matrix $A = \begin{pmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{pmatrix}$	C110.1
3	Whats is the value of a,b,c ,if the vector $\vec{F} = (x + y + az)\vec{\imath} + (by + 2y - z)\vec{\jmath} + (-x + cy + 2z)\vec{k}$ may be irrotational	C110.2

Name and Signature of the Faculty Incharge [N.Vinnya]

HoD/S&H
SRI BHARATHI ENGINEERING
COLLEGE FOR WOMEN
KAIKKURICHI
PUDUKKOTTAI - 622 303.

Dr. S.THILAGAVATHI M.E.,Ph.D.,
PRINCIPAL
SRI BHARATHI ENGINEERING
COLLEGE FOR WOMEN
Kaikkurchi - 622 303, Pudukkottai Dt.

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Tutorial Answer Sheet

Name of the Student : K. Rohini

AU Register Number: 912618106009

Tutorial – 01			Date of Issue:	17.09.2018	Marks	10
Course code	MA8251	Course Title	Engineering mathematics-II			
Year	I	Semester/Section	I/B	Date of Submission:	19.09.2018	

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Mark Allocation

Rubrics	Marks Allocated	Marks obtained
Problem solving approach	6	5
Correctness of Answer	2	4
Timely submission	2	4
Total marks	10	9

N. Vinny [N. Vinny]

Name and Signature of the Faculty Incharge

HoD/S&H

Dr. S.THILAGAVATHI M.E.,Ph.D.,
PRINCIPAL
SRI BHARATHI ENGINEERING
COLLEGE FOR WOMEN
Kaikkurichi - 622 303, Pudukkottai Dt.

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1. Find the eigenvalues and eigenvector of $\begin{pmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$

Solution:

Step: 1 To find characteristic equation and eigenvalues:

Let $A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$

The characteristic equation $|A - \lambda I| = 0$

$$\begin{vmatrix} 2-\lambda & 1 & 0 \\ 0 & 2-\lambda & 1 \\ 0 & 0 & 2-\lambda \end{vmatrix} = 0$$

$$(2-\lambda)(2-\lambda)(2-\lambda) = 0$$

$$\boxed{\lambda = 2, 2, 2}$$

The eigenvalues are 2, 2, 2

Step 2: To find eigenvectors:

The eigenvector $X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$

$$(A - \lambda I) X = 0$$

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$$\begin{pmatrix} 2-\lambda & 1 & 0 \\ 0 & 2-\lambda & 1 \\ 0 & 0 & 2-\lambda \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$(2-\lambda)x_1 + x_2 + 0x_3 = 0$$
$$0x_1 + (2-\lambda)x_2 + x_3 = 0$$
$$0x_1 + 0x_2 + (2-\lambda)x_3 = 0$$

When $\lambda = 2$

$$\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix} \quad \begin{matrix} 0x_1 + x_2 + 0x_3 = (1) \\ 0x_1 + 0x_2 + x_3 = (2) \\ 0x_1 + 0x_2 + 0x_3 = (3) \end{matrix}$$

equation (2) and (3)

$$\frac{x_1}{1} = \frac{x_2}{0} = \frac{x_3}{0} = k$$

$$X = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

The eigenvector is $X_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$

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2. Diagonalise the metrix $A = \begin{pmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{pmatrix}$ by means of orthogonal transformation.

Solution:

Step 1: The characteristic equation:

$$\lambda^3 - c_1\lambda^2 + c_2\lambda_3 - c_3 = 0$$

$$\begin{pmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{pmatrix}$$

c_1 = Sum of the diagonal element

$= 3+3+3$

$\boxed{c_1 = 9}$

$$c_2 = \begin{vmatrix} 3 & -1 \\ -1 & 3 \end{vmatrix} + \begin{vmatrix} 3 & 1 \\ 1 & 3 \end{vmatrix} + \begin{vmatrix} 3 & 1 \\ 1 & 3 \end{vmatrix}$$

$= 9-1+9-1+9-1$

$= 8+8+8$

$\boxed{c_2 = 24}$

$c_3 = |A|$

$= 3(9-1) - 1(3+1) + 1(-1-3)$

$= 3(8) - 1(4) + 1(-4)$

$= 24 - 4 - 4$

$\boxed{c_3 = 16}$

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Step 2: To find the eigenvalues

$$\lambda^3 - 9\lambda^2 + 24\lambda - 16 = 0$$

1		1	-9	24	-16
		0	1	-8	16
		1	-8	16	0

$$\lambda^2 + 8\lambda - 16 = 0$$

$$\lambda^2 = 4 \quad \Rightarrow \quad \lambda^3 = 4$$

$$\lambda_1 = 1, \quad \lambda_2 = 4, \quad \lambda_3 = 4$$

Step 3: To find the eigenvectors:

$$(A - \lambda I)\, X = 0$$

$$\begin{pmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = 0$$

$$2x_1 + x_2 + x_3 = 0 \quad \rightarrow (1)$$

$$x_1 + 2x_2 - x_3 = 0 \quad \rightarrow (2)$$

$$x_1 - x_2 + 2x_3 = 0 \quad \rightarrow (3)$$

equation (1) and (2)

$$\frac{x_1}{-1-2} = \frac{x_2}{1+2} = \frac{x_3}{4-1}$$

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PRINCIPAL
SRI BHARATHI ENGINEERING
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$$X_1 = \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}$$ eigenvector

put $\lambda = 4$

$$\begin{pmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{pmatrix} - \begin{pmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

$$-1x_1 + x_2 + x_3 = 0 \rightarrow (1)$$
$$x_1 - x_2 - x_3 = 0 \rightarrow (2)$$
$$x_1 - x_2 - x_3 = 0 \rightarrow (3)$$

$$X_2 = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} \quad X_3 = \begin{pmatrix} -1 \\ 1 \\ 2 \end{pmatrix}$$

The three eigenvectors are

$$X_1 = \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}; \; X_2 = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}; \; X_3 = \begin{pmatrix} -1 \\ 1 \\ 2 \end{pmatrix}$$

Step 4: P

$$P = \begin{pmatrix} -1/\sqrt{3} & 1/\sqrt{2} & -1/\sqrt{6} \\ 1/\sqrt{3} & 1/\sqrt{2} & 1/\sqrt{6} \\ 1/\sqrt{3} & 0 & -2/\sqrt{6} \end{pmatrix} \quad \text{and} \quad P^1 = \begin{pmatrix} -1/\sqrt{3} & 1/\sqrt{3} & 1/\sqrt{3} \\ 1/\sqrt{2} & 1/\sqrt{2} & 0 \\ 1/\sqrt{6} & 1/\sqrt{6} & -2/\sqrt{6} \end{pmatrix}$$

$$AP = \begin{pmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{pmatrix} \begin{pmatrix} -1/\sqrt{3} & 1/\sqrt{2} & -1/\sqrt{6} \\ 1/\sqrt{3} & 1/\sqrt{2} & 1/\sqrt{6} \\ 1/\sqrt{3} & 0 & -2/\sqrt{6} \end{pmatrix}$$

$$= \begin{pmatrix} -1/\sqrt{3} & 4/\sqrt{2} & -4/\sqrt{6} \\ 1/\sqrt{3} & 4/\sqrt{2} & 4/\sqrt{6} \\ 1/\sqrt{3} & 0 & -8/\sqrt{6} \end{pmatrix}$$

$$P'AP = \begin{pmatrix} -1/\sqrt{3} & 1/\sqrt{3} & 1/\sqrt{3} \\ 1/\sqrt{2} & 1/\sqrt{2} & 0 \\ -1/\sqrt{6} & 1/\sqrt{6} & -2/\sqrt{6} \end{pmatrix} \begin{pmatrix} -1/\sqrt{3} & 4/\sqrt{2} & -4/\sqrt{6} \\ 1/\sqrt{3} & 4/\sqrt{2} & 4/\sqrt{6} \\ 1/\sqrt{3} & 0 & -8/\sqrt{6} \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$$

$P'AP = D$ which is the diagonal matrix

3. Find the values of a, b, c so that the vector $\vec{F} = (x+y+az)\vec{i} + (bx+2y-z)\vec{j} + (-x+cy+2z)\vec{k}$ be irrotational

Solution:

$$\vec{F} = \nabla \times \vec{F}$$

$$\nabla \times \vec{F} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ x+y+az & bx+2y-z & -x+cy+2z \end{vmatrix}$$

Dr S.THILAGAVATHI M.E.,Ph.D.,
PRINCIPAL
SRI BHARATHI ENGINEERING
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$$= \vec{i}\left[\partial/\partial y\,(-x+cy+2z) - \partial/\partial z\,(bx+2y-z)\right]$$

$$-\vec{j}\left[\partial/\partial x(-x+cy+2z) - \partial/\partial z\,(x+y+az)\right]$$

$$+\vec{k}\left[\partial/\partial x(bx+2y-z) - \partial/\partial y\,(x+y+az)\right]$$

$$= \vec{i}\,(c+1) - \vec{j}\,(-1-a) + \vec{k}\,(b-1)$$

Given $\nabla \times \vec{F} = 0$

$c+1 = 0 \Rightarrow \boxed{c = -1}$

$-1-a = 0 \Rightarrow \boxed{a = -1}$

$b-1 = 0 \Rightarrow \boxed{b = 1}$

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PRINCIPAL
SRI BHARATHI ENGINEERING
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