RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Faculty of Mathematical and Physical Sciences			
Ramaiah University of Applied Sciences			
Department	Mathematics	Programme	B.Tech (All branches)
Semester/Batch	3/ 2017		
Course Code	BSC207A	Course Title	Engineering Mathematics-3
Course Leader(s)	Dr Shivashankar C. Dr Gireesh D S, Dr Somashekhar G, Dr Mahadev Channakote, Sakshath T. N., Siddabasappa C.		

Assignment 2

Reg.No.		**Name of Student**	

			Marks		
			Max Marks	**First Examiner Marks**	**Moderator**
Question 1.	**1.1**	**Determining the values of a, b, c for which the given ideal fluid is irrotational**	3		
	1.2	**For verifying the given ideal fluid is incompressible or not incompressible**	2		
	1.3	**To obtain the scalar potential ϕ such that $\mathbf{F}(x, y, z) = \nabla\phi$**	2		
	1.4	**Plotting the given vector field**	2		
	1.5	**Conclusion**	1		
		Q.1 Max Marks	**10**		
Question 2.					
	2.1	**Fourier series expansion using harmonic analysis**	4		
	2.2	**MATLAB function for Fourier series expansion**	4		
	2.3	**Least square error**	2		
	2.4	**Plot (observed data points and approximated Foureir series)**	3		
	2.5	**Conclusion**	2		
		Q.2 Max Marks	**15**		
		Total Assignment Marks	25		

Course Marks Tabulation

Component-1 (B) Assignment	**First Examiner**	**Remarks**	**Moderator**	**Remarks**
Q.1				
Q.2				
Marks (Max 25)				

Signature of First Examiner **Signature of Moderator**

RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Please note:

1. Documental evidence for all the components/parts of the assessment such as the reports, photographs, laboratory exam / tool tests are required to be attached to the assignment report in a proper order.
2. The First Examiner is required to mark the comments in RED ink and the Second Examiner's comments should be in GREEN ink.
3. The marks for all the questions of the assignment have to be written only in the **Component – CET B: Assignment** table.
4. If the variation between the marks awarded by the first examiner and the second examiner lies within +/- 3 marks, then the marks allotted by the first examiner is considered to be final. If the variation is more than +/- 3 marks then both the examiners should resolve the issue in consultation with the Chairman BoE.

Assignment 2

Instructions to students:

1. The assignment consists of **2** questions.
2. Maximum marks is **25**.
3. The assignment has to be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to **10**.
5. The printed assignment must be submitted to the course leader.
6. **Submission Date: 22/10/2018**
7. **Submission after the due date is not permitted.**
8. **IMPORTANT**: It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
9. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

Preamble

This course deals with vector calculus, various transform techniques in the context of engineering problems. The rudimentary principles and important theorems in vector calculus are taught in this course. The assumptions, principles and distinguishing features of Fourier series, Fourier transform and Laplace transform are emphasized. This course also covers the underlying principles and applications of transform techniques in various engineering disciplines. This course also aims at solving engineering problems associated with Fourier series, Fourier transform and Laplace transform methods using MATLAB.

RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Q.1. **(10 Marks)**

A vector field for an ideal fluid is given by

$$\boldsymbol{F}(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}) = (y^a \sin x + z^b)\boldsymbol{i} - (3y^2 \cos x - ce^{cy}z)\boldsymbol{j} + (5xz^4 + e^{7y})\boldsymbol{k} \text{ then}$$

1.1. Determine the values of a, b, c for which the given ideal fluid is irrotational.

1.2. Verify whether the irrotational vector field is incompressible or not.

1.3. Obtain the scalar potential ϕ such that $\mathbf{F}(x,y,z) = \nabla\phi$.

1.4. Plot the given vector field in the intervals $-4 \le x \le 4,\ -4 \le y \le 4,\ -4 \le z \le 4$.

1.5. Conclusion.

Q.2. **(15 Marks)**

The variations of periodic current over a period in an electrical circuit is give as follows:

t (sec)	0	$T/6$	$T/3$	$T/2$	$2T/3$	$5T/6$	T
A (ampere)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

2.1. Write a Fourier series expansion for the given data points up to third harmonics using Harmonic analysis method.

2.2. Write a MATLAB function to estimate the Fourier coefficients of first and second harmonics to be fitted above data.

2.3. Calculate the least square error between observation and approximation by Fourier series given by the following:

$$E = \sum_{i=1}^{N} |O_i - F_i|^2$$

where O_i and F_i, respectively, represent the observed data points and corresponding approximation of Fourier series. The MATLAB function should also return the error as an output.

2.4. Plot the observed data point using symbol '*' and the approximation by Fourier series as a solid line in same graph.

2.5. Conclusion