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 1

Reg.No.		**Name of Student**	

Sections		Marking Scheme	Marks: Max Marks	First Examiner Marks	Moderator
Question 1.					
	1.1	Construction of mathematical model	2		
	1.2	Solution of Mathematical model using Laplace transform	4		
	1.3	Plotting solution	3		
	1.4	Conclusion	1		
		Q.1 Max Marks	**10**		
Question 2.					
	2.1	Writing periodic function	2		
	2.2	MATLAB function for plotting periodic function	2		
	2.3	Checking whether the periodic function is even or odd	2		
	2.4	Finding the Fourier series expansion for the given wave	3		
	2.5	MATLAB function for Fourier series expansion	3		
	2.6	Plotting of Fourier series expansion and periodic function for $N = 10, N = 20$	2		
	2.7	Conclusion	1		
		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**

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 1

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: 24/09/2018**
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.

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

A load of mass $8\ kg$ is attached to the lower end of the coil spring suspended from the ceiling, the spring constant of the spring being $5\ kg/m$. The load comes to rest in its equilibrium position. Beginning at $t = 0$ an external force given by $f(t) = 5\cos 2t$ is applied to the system. If the damping force in kilograms is numerically equal to $2y'(t)$, where $y'(t)$ is the instantaneous velocity in meter per second.

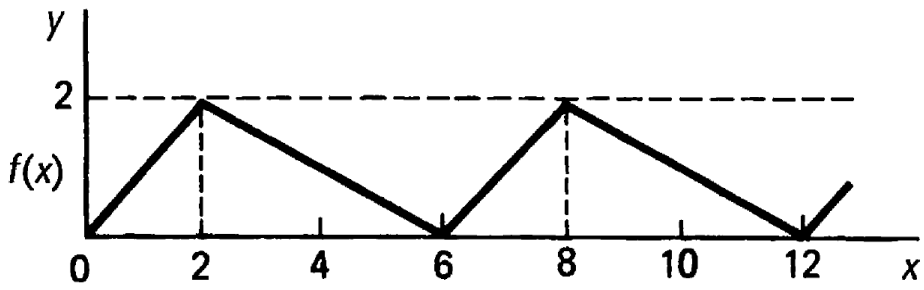
1.1. Obtain the mathematical model.

1.2. Determine the resulting motion of the initial value problem using Laplace transform for the initial conditions (i) $y(0) = 0, y'(0) = 0$ and (ii) $y(0) = 0, y'(0) = 5$.

1.3. Plot the solutions using the initial conditions given in (i) and (ii) in the same graph to compare the effects of initial displacement and velocity on motion in the interval $[0, 5]$. Also, interpret the graph.

Q.2. **(15 marks)**

We often have situations where wave repeats at regular intervals.
For example Electromagnetic wave in optical fibre or Sound from a guitar string etc. These regularly repeating waves are known as periodic waves. We can characterize periodic waves either by the length scale, wavelength, or the time scale, period, at which they repeat. Fourier series is a way to represent a function as the sum of simple sine waves.
For the given periodic wave form



2.1. Write the periodic function for the above wave

2.2. Plot the periodic function in the interval $[-24,24]$.

2.3. Check whether the periodic function is even or odd.

2.4. Determine Fourier series expansion for the given wave.

2.5. Write a MATLAB function to determine the Fourier series expansion for the given wave for $N = 5$.

2.6. Plot the wave and Fourier series expansion in the interval $[-24,24]$ for

I. N=10

II. N=20

2.7. Conclusion.