Faculty of Science and Humanities			
Ramaiah University of Applied Sciences			
Department	Mathematics	Programme	B. Tech.
Semester/Batch	1/2017		
Course Code	BSC101A	Course Title	Engineering Mathematics – 1
Course Leader(s)	Deepak A. S., Mahesha Narayana, Chandankumar S., Shekar M., Hemanthkumar B., and Meenakshi N.		

Assignment – 01			
Reg. No.		**Name of Student**	

Sections		Marking Scheme	Max Marks	First Examiner Marks	Moderator
Part-A	A.1	Description of Riemann sum	3		
	A.2	Geometrical meaning and sketch	3		
	A.3	MATLAB function	3		
	A.4	Conclusion	1		
		Part-A1 Max Marks	10		
Part B 1	B1.1	Compute velocity and acceleration	4		
	B1.2	Graph of displacement curve	2		
	B1.3	Show that the particle comes to rest at least once before attaining the uniform velocity	3		
	B1.4	Conclusion	1		
		Part-B1 Max Marks	10		
Part B 2	B2.1	Maclaurin series for the kinetic energy K	6		
	B2.2	Show that when v is very small, $K = \frac{1}{2} m_0 v^2$	3		
	B2.3	Conclusion	1		
		Part-B2 Max Marks	10		
Part B 3	B3.1	Explanation of algorithm	3		
	B3.2	MATLAB function	4		
	B3.3	MATLAB built-in function 'find'	2		
	B3.4	Conclusion	1		
		Part-B3 Max Marks	10		
Part B 4	B4.1	Formation of linear system	2		
	B4.2	Solution of linear system	4		
	B4.3	MATLAB function	3		
	B4.4	Conclusion	1		
		Part-B 4 Max Marks	10		
		Total Assignment Marks	**50**		

Course Marks Tabulation				
Component-1 (B) Assignment	**First Examiner**	**Remarks**	**Moderator**	**Remarks**
A				
B.1				
B.2				
B.3				
B.4				
Marks (Max 50)				
Marks (out of 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 – 01
Term - 1

Instructions to students:

1. The assignment consists of **5** questions: Part A – **1** Question, Part B- **2** Questions.
2. Maximum marks is **50**.
3. The assignment has to be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to **20**.
5. Restrict your report for Part-A to 3 pages only.
6. Restrict your report for Part-B to a maximum of 17 pages.
7. The printed assignment must be submitted to the course leader.
8. **Submission Date: 09/10/2017**
9. **Submission after the due date is not permitted.**
10. **IMPORTANT**: It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
11. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Preamble

The course introduces students to the basic concepts and techniques in real and complex analyses, matrix algebra and numerical analysis. Students are taught the concepts of derivative, continuity, limits, series expansion, functions and integrals of real and complex variables. The utility of Cauchy's Integral and residue theorem in the evaluation of an integral is emphasized. The mathematical operations in Matrix theory, Eigen value and Eigen vector, Inversion and diagonalization of matrix and matrix solution for linear system of equations are discussed in this course. This course also deals with the underlying concepts of finding the roots, solving the linear systems in the context of numerical analysis and implementation of the schemes in MATLAB.

Part-A (10 Marks)

Write an essay on the topic "**Integration: Riemann Sums**". Your report should highlight the following:

A.1 Description of the concept of Riemann sum using the three methods: left rectangles, right rectangles and mid-point rectangles with an example.

A.2 Description of the geometrical meaning of Riemann sums with sketch of the left rectangles, right rectangles and mid-point rectangles using an example.

A.3 MATLAB function to compute the Riemann sum using left rectangles, right rectangles and mid-point rectangles.

A.4 Comparison of the results of the above three methods and conclusion.

Part B (40 Marks)

B.1. **(10 Marks)**

A mechanism propels a particle along a straight line. It is designed so that the displacement of the particle at time t from an initial point 'O' on the line is given by the formula $s(t) = \frac{1}{2}(t^2 + 5t \sin t)$. The mechanism works perfectly until time $t = \pi$ when an unexpected malfunction occurs. From then the particle moves with constant velocity that was attained at $t = \pi$.

B.1.1 Compute velocity and acceleration at $t = \frac{\pi}{2}$ and $t = \frac{3\pi}{2}$.

B.1.2 Plot the graph of displacement curve.

B.1.3 Show that the particle comes to rest at least once before attaining uniform velocity.

B.1.4 Conclude and comment on the results.

B.2. **(10 Marks)**

In Einstein's theory of special relativity, the mass $'m'$ of an object moving with velocity $'v'$ is given by the equation:

$$m = m_0\left(1 - \frac{v^2}{c^2}\right)^{-1/2},$$

where m_0 is the mass of the object at rest and c is the speed of light. The kinetic energy $'K'$ of the object is the difference between its total energy and energy at rest and is given by the equation:

$$K = mc^2 - m_0c^2$$

B.2.1 Obtain the Maclaurin series for the kinetic energy as a function of the velocity.

B.2.2 Show that when v is very small compared to c, the expression for K agrees with the classical Newtonian physics given by $K = \frac{1}{2}m_0v^2$.

B.2.3 Comment on the results and conclude.

B.3. **(10 Marks)**

Consider an array $X = [x_1, x_2, \cdots, x_n]$ of size $1 \times n$ by creating a random array in MATLAB and perform the following:

B.3.1 Choose any algorithm to search the index of a given element in vector X and explain.

B.3.2 Write a MATLAB function to implement the above chosen algorithm. The function should accept the array and an element as input and should output the index of that element in the given array.

B.3.3 Use MATLAB built-in function 'find' to search the index of the required element. Compare and comment on the results.

B.4. **(10 Marks)**

A metal grid consists of four thin metal bars. The end of each bar of the grid is kept at a constant temperature as shown in figure 1. Assume that the temperature at each intersection point in the grid is the average of temperatures at four adjacent points in the grid (adjacent points are either intersection points or ends of bars).

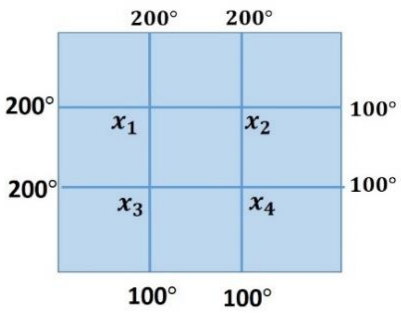

Figure 1

B.4.1 Obtain equations for the temperature at the four intersection points.

B.4.2 Solve the resultant system to find the temperature at each intersection point in the grid.

B.4.3 Write a MATLAB script to check for the consistency of the system and obtain the solution.

B.4.4 Comment on the results obtained and conclude.