RAMAIAH UNIVERSITY OF APPLIED SCIENCES

ASSIGNMENT

Course Code	BSC208A
Course Name	Engineering Mathematics - IV
Programme	B.Tech
Department	CSE
Faculty	FET

Name of the Student	Satyajit Ghana
Reg. No	17ETCS002159
Semester/Year	04/2017
Course Leader/s	Dr. Somashekhara G.

<table>
<tr><th colspan="4">Declaration Sheet</th></tr>
<tr><td>Student Name</td><td colspan="3">Satyajit Ghana</td></tr>
<tr><td>Reg. No</td><td colspan="3">17ETCS002159</td></tr>
<tr><td>Programme</td><td>B.Tech</td><td>Semester/Year</td><td>04/2017</td></tr>
<tr><td>Course Code</td><td colspan="3">BSC208A</td></tr>
<tr><td>Course Title</td><td colspan="3">Engineering Mathematics - IV</td></tr>
<tr><td>Course Date</td><td></td><td>to</td><td></td></tr>
<tr><td>Course Leader</td><td colspan="3">Dr. Somashekhara G.</td></tr>
</table>

Declaration

The assignment submitted herewith is a result of my own investigations and that I have conformed to the guidelines against plagiarism as laid out in the Student Handbook. All sections of the text and results, which have been obtained from other sources, are fully referenced. I understand that cheating and plagiarism constitute a breach of University regulations and will be dealt with accordingly.

<table>
<tr><td>Signature of the Student</td><td></td><td>Date</td><td></td></tr>
<tr><td>Submission date stamp
(by Examination & Assessment Section)</td><td colspan="3"></td></tr>
</table>

Signature of the Course Leader and date	Signature of the Reviewer and date

Figure No.	**Title of the figure**	**Pg.No.**

<u>Question No. 1</u>

<u>Solution to Question No. 1:</u>

Q 1.1 Write the one-dimensional heat equation with initial and boundary conditions:

The General form of the one-dimensional heat equation is:

$$c^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$$

$$c = 1$$

Given the rod extends from $x = 0$ to $x = 8$

$$0 \leq x \leq 8$$

$l = 8$

Taking the boundary conditions:

$$u(0, t) = 0$$

$$u(8, t) = 0$$

Taking the initial conditions:

$$u(x, 0) = f(x)$$

$$u(x, 0) = 4x - \frac{1}{2}x^2$$

The given time interval is $0 \leq t \leq 2$

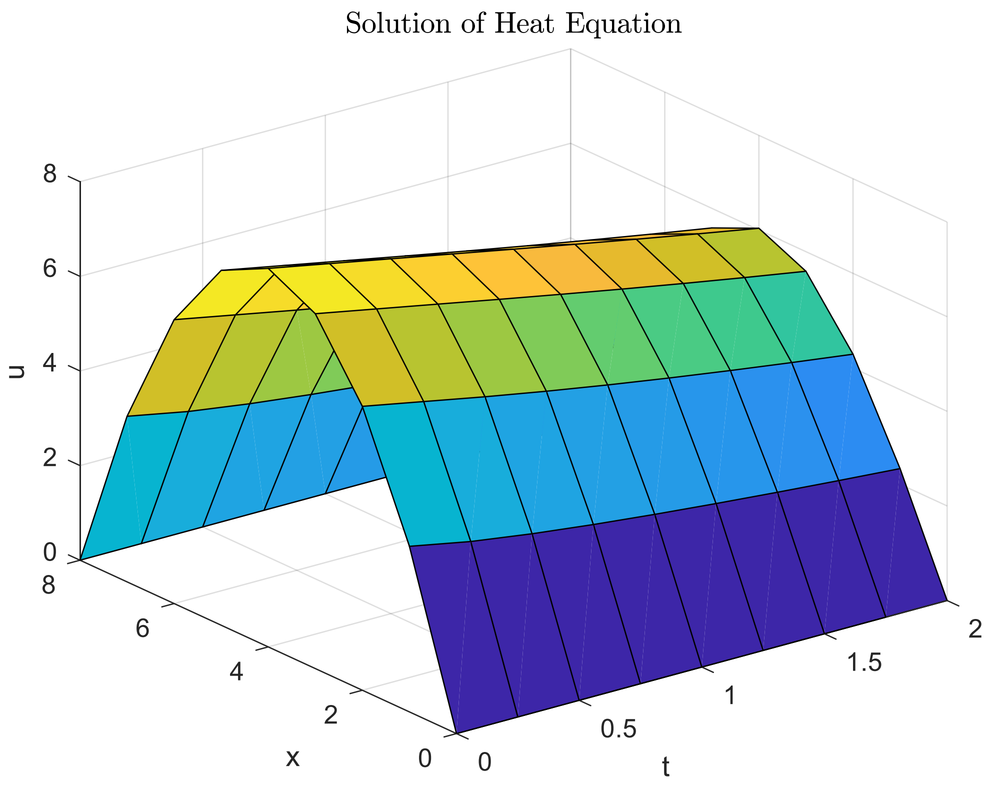
Q 1.2 Write the MATLAB code to solve the boundary value problem with finite difference method with $h = 1$ and $k = \frac{1}{4}$:

```
function [u] = heateqn(x0, xn, t0, tn, h, k, c)
%HEATEQN Solves the heat equation numerically using finite
difference
%   Params:
%           x0 <= x <= xn
%           t0 <= t <= tn
%           c: heat equation param
%           h, t: precision along x and y axis
%
%   Author : Satyajit Ghana 17ETCS002159

x = x0:h:xn;
t = t0:k:tn;
m = length(x);n = length(t);

u = zeros(m, n);
% a = k*(c/h)^2;
a = c*k/h^2;

f = @(x) 4.x - (0.5.*x.^2);
```

```
u(:, 1) = f(x);

if a > 0.5
    fprintf('Method fails\n');
    return
end

for j = 1:n-1
    for i = 2:m-1
        u(i, j+1) = a * (u(i+1, j) + u(i-1, j)) + (1-2*a) * u(i,
j);
    end
end

% [X, T] = meshgrid(x, t);
surf(t, x, u);
xlabel('t');
ylabel('x');
zlabel('u');

end
```

Q 1.3 Plot the solution of the partial differential equation $u(x,t)$ for $0 \le x \le 8$ and $0 \le t \le 2$:

```
u = heateqn(0, 8, 0, 2, 1, 0.25, 1);
```



Question No. 2

Solution to Question No. 2:

Refer Excel Sheet

Q 2.6 Identify minimum and maximum variability:

Correlation Coeff.	vs	BLAD	LUNG	KID	LEUK
	CIG	0.70362	0.6974	0.48739	-0.0685

From the correlation coefficient of the various data we can determine the variability of the data around the regression line.

The correlation coefficient lies from -1 to 1, if the value is close to 0 then we can say that it has maximum variability and if it's more away from 0 then it has least variability, i.e. it is either close to -1 or 1.

From the coefficients obtained,

CIG vs BLAD is 0.70362, which is close to 1, hence it has minimum variability.

CIG vs LUNG is 0.69740 which is also close to 1, hence has low variability.

CIG vs KID is 0.48738, which is close to 0 hence has higher variability.

CIG vs LEUK is -0.0685 which is almost equal to 0 hence has highest variability.

Hence, we can conclude that CIG vs BLAD has the minimum variability and greatest consistency since it's correlation coefficient is highest and close to 1.

CIG vs LEUK has the maximum variability and least consistency since it's correlation coefficient is lowest and close to 0.

Question No. 3

Solution to Question No. 3:

Introduction,

Probability of any event E is given by,

$$p(E) = \frac{Favourable\ Events}{Total\ Events}$$

Let 9 yellow, 4 magenta and 7 brown marbles are arranged randomly in a line. Assume all marbles are distinct, even if with the same colour.

Q 3.1 The Probability that the first 4 marbles are yellow:

Out of 9 yellow marbles 4 are chosen and arranged, hence the probability is given as,

$$P(first\ 4\ marbles\ yellow)$$

$$= \frac{Select\ Yellow\ Marbles \times Mutual\ Arrangement \times Arrange\ Remaining}{Total\ Events}$$

$$= \frac{9C_4 \times 4! \times 16!}{20!}$$

$$= \frac{126 \times 24 \times 16!}{20 \times 19 \times 18 \times 17 \times 16!}$$

$$= \frac{42}{1615}$$

Q 3.2 The probability that none of final 4 marbles is brown:

Consider that last final 4 marble are either yellow or magenta or combination of both.

$$P(4\ non - brown\ marbles) = \frac{Select\ non - brown \times Mutual\ Arrangement \times Arrange\ Remaining}{Total\ Events}$$

$$= \frac{13C_4 \times 4! \times 16!}{20!}$$

$$= \frac{715 \times 24 \times 16!}{20 \times 19 \times 18 \times 17 \times 16!}$$

$$= \frac{143}{969}$$

Q 3.3 The probability that the first 3 marbles are of different colours:

Choose distinct marbles with different colour and arrange them , then arrange remaining marbles

$$P(first\ 3\ marbles\ different\ colour)$$

$$= \frac{(Select\ Yellow)(Select\ Brown)(Select\ Magenta)(Mutual\ Arrange)(Arrange\ Remaining)}{Total\ Events}$$

$$= \frac{(9C_1 \times 4C_1 \times 7C_1)3! \times 16!}{20!}$$

$$= \frac{(7 \times 9 \times 4) \times 6 \times 17!}{20 \times 19 \times 18 \times 17!}$$

$$= \frac{1512}{6840}$$

$$= \frac{21}{95}$$

Q 3.4 The probability that all same colour marbles are together.

To keep all the same colour marbles together, arrange 1st colour marble then arrange 2nd colour marble then arrange 3rd colour marble and then arrange them mutually, this is equivalent to favorable events

$$P(all\ same\ colour) = \frac{\begin{array}{c}(selection \times arrangement\ of\ yellow\ marble) \times \\ (selection \times arrangement\ of\ brown\ marble) \times \\ (selection \times arrangement\ of\ magenta\ marble) \times 3!\end{array}}{total\ possible\ events}$$

This can also be written as :

Since the selection is always 1, hence the permutation needs to be done,

$$= \frac{(9C_9 \times 9!)(7C_7 \times 7!)(4C_4 \times 4!) \times 3!}{20!}$$

$$= \frac{9! \times 7! \times 4! \times 3!}{20!}$$

$$= \frac{1}{9237800}$$

1.