USN | | | | | | | | | | | 10MAT41

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Using Taylor series method, solve $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ at the point x = 0.2, 0.3 consider up to 4th degree term. **(06 Marks)**

b. Using Runge Kutta method of order 4, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1 at x = 0.2, 0.4 by taking step length h0.2. **(07 Marks)**

c. Given $\frac{dy}{dx} = \frac{1}{2}xy$, y(0) = 1, y(0.1) =1.0025, y(0.2)=1.0101, y(0.3)=1.0228. Compute y at x = 0.4 by Adams – Bash forth predictor – corrector method use corrector formula twice. **(07 Marks)**

2 a. Evaluate y and z at x = 0.1 from the Picard's second approximation to the solution of the following system of equations given by y = 2 and z = 1 at x = 0 initially $\frac{dy}{dx} = x + z$ $\frac{dz}{dx} = x - y^2$. **(06 Marks)**

b. Given $y'' = x^3(y + y')$ with the initial condition y(0) = 1 y'(0) = 0.5 compute y(0.1) by taking h = 0.1 and using 4th order Runge Kutta method. **(07 Marks)**

c. Applying Milne's method compute y(0.4) Given that y satisfies the equation $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0$ and y and y' are governed by the following values

y(0) = 1, y(0.1) = 1.03995, y(0.2) = 1.138036
y(0.3) = 1.29865, y'(0) = 0.1, y'(0.1) = 0.6955
y'(0.2) = 1.258, y'(0.3)=1.873. **(07 Marks)**

3 a. Derive Cauchy Riemann Equation in Cartesian form. **(06 Marks)**

b. Prove that for every analytic function f(z) = u + iv the two families of curves u(x,y) = C_1 and v(x,y) = C_2 form an orthogonal system. **(07 Marks)**

c. If u – v = (x – y) (x^2 + 4xy + y^2) and f(z) = u + iv is analytic function of z = x + iy find f(z) interms of f(z). **(07 Marks)**

4 a. Find the bilinear transformation that maps the points z = 0, i, ∞ onto the points w = 1, – i, – 1 respectively, find the invariant points. **(06 Marks)**

b. Discuss the transformation $w = e^z$. **(07 Marks)**

c. Evaluate $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$, where c is the circle |z| = 3. **(07 Marks)**

PART – B

5 a. Starting from Laplace differential equation. Obtain Bessel's differential equation as $xy'' + xy' + (x^2 - n^2)y = 0$ **(08 Marks)**

b. If $x^3 + 2x^2 - x + 1 = a\,P_0(x) + b\,P_1(x) + c\,P_2(x) + d\,P_3(x)$ find the value of a, b, c, d. **(06 Marks)**

c. Derive Rodrigue's formula $P_n(x) = \frac{1}{2^n n!}\frac{dy}{dx^n}(x^2-1)^n$ **(06 Marks)**

6 a. Define axioms of probability. Prove that,
$P(A \cup B \cup C) = P(A) + P(B) + P(C) + P(A \cap B \cap C) - P(A \cap B) - P(B \cap C) - P(C \cap A)$ **(06 Marks)**

b. A solar water heater manufactured by a company consists of two parts the heating panel and the insulated tank. It is found that 6% of the heaters produced by the company have defective heating panels and 8% have defective tank. Find the percentage of non defective heaters produced by the company. **(07 Marks)**

c. A box contains 500 IC chips of which 100 are manufactured by company X and the rest by company Y. It is estimated that 10% of the chips made by company X and 5% made by company Y are defective. If a randomly selected chip is found to be defective find the probability that it came from company X. **(07 Marks)**

7 a. A random variables X takes the values -3, -1, 2 and 5 with respective probabilities $\frac{2k-3}{10}, \frac{k-2}{10}, \frac{k-1}{10}, \frac{k+1}{10}$. Find the value of k and i) $p(-3 < x < 4)$ ii) $p(x \le 2)$. **(06 Marks)**

b. Find the mean and variance of binomial distribution. **(07 Marks)**

c. In an examination 7% of students scores less than 35% marks and 89% of students score less than 60% marks. Find the mean and standard deviation of the marks are normally distribute, it is given that $P(0 < z < 1.2263) = 0.39$ and $P(0 < z < 1.4757) = 0.43$. **(07 Marks)**

8 a. Explain the following terms :
  i) Null hypothesis
  ii) Type I and Type II error
  iii) Confidence limits. **(06 Marks)**

b. A coin is tossed 1000 times and it turn up head 540 times decide on the hypothesis that the coin is unbiased. **(07 Marks)**

c. A certain stimulus administered to each of the 12 patients resulted is the following change is blood pressure 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4 can it be calculated that the stimulus will increase the blood pressure ($t_{0.05}$ for 11 df 2.201.) **(07 Marks)**

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Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Graph Theory and Combinatorics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define : (i) Complete graph (ii) Induced Subgraph (ii) Euler's circuit. Give one example for each. **(05 Marks)**

b. Show that there is no graph with 12 vertices and 28 edges where
   i) The degree of each vertex is either 3 or 4
   ii) The degree of each vertex is either 3 or 6 **(05 Marks)**

c. Define isomorphism of two graphs. By labeling the graphs shows that two graphs are isomorphic.

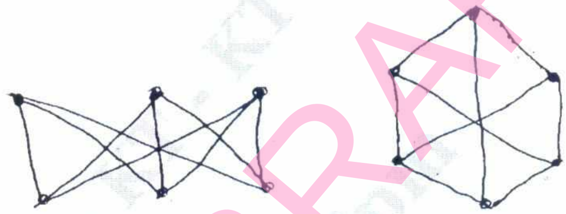

Fig Q1(c) **(05 Marks)**

d. Let G = (V, E) be the undirected graph in Fig Q1(d) How many paths are there in G from a to h? How many of these paths have a length 5?

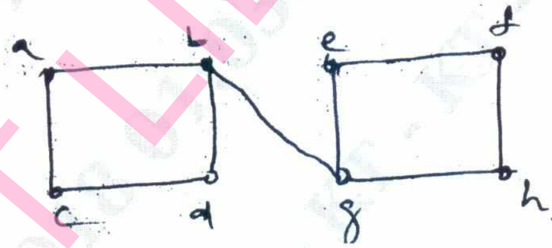

Fig Q1(d) **(05 Marks)**

2 a. A connected planar graph G with n vertices and m edges has exactly m – n + 2 regions in all of its diagrams. **(07 Marks)**

b. If 4 colours are used, find in how many ways can this graph be properly coloured? Hence find the chromatic number (Refer Fig Q2(b)

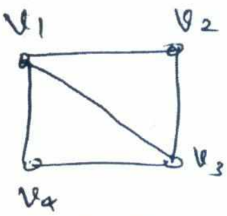

Fig Q2(b) **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

c. Consider the graph $K_2, 3$ shown below, Let λ devote the number of colours available to properly colour the vertices of this graph find
   i) How many proper colouring of the graph have vertices a, b coloured same
   ii) How many proper colourings of the graph have vertices a, b coloured differently.
   iii) The cheomatic polynomial of the graph.

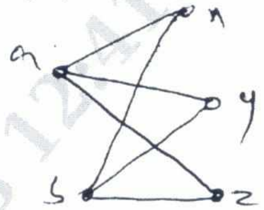

Fig Q2(c) **(06 Marks)**

3 a. Define a binary rooted tree and show that a tree with n vertices has n – 1 edge. **(07 Marks)**
b. Obtain an optimal prefix code for the message LETTER RECEIVED Indirect the code. **(07 Marks)**
c. Define: i) Weighted Tree ii) Prefix codes iii) Optimal prefix code. **(06 Marks)**

4 a. Explain Prim's Algorihtm and find a minimal spanning tree for the weighted graph show below

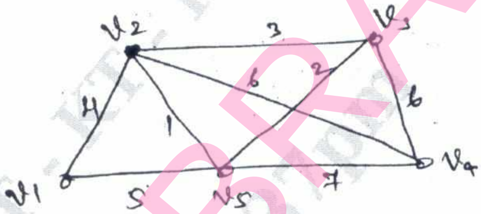

Fig Q4(a) **(06 Marks)**

b. State and prove maximum flow and minimum cut theorem. Also find the maximum flow from the vertices A and vertex Z in the network shown below

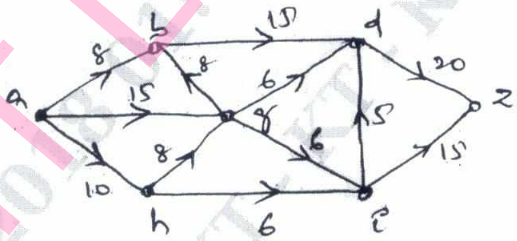

Fig Q4(b) **(07 Marks)**

c. Using the Dijkstras algorithm, obtain the shortest path from vertex 1 to each of the other vertices in the weighted, directed network shown below indicate the weight of these shortest paths.

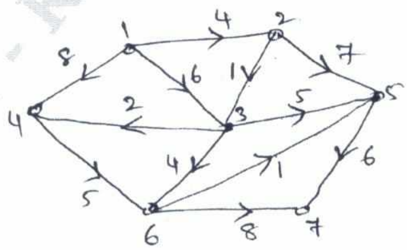

Fig Q4(c) **(07 Marks)**

PART – B

5 a. How many arrangement are the for all letters in the world SOCIOLOGICAL? In how many of these arrangement (i) A and G are adjacent (ii0 All the vowels are adjacent. **(07 Marks)**

b. Determine the coefficient of $x^2y^2z^3$ the expansion of $(3x - 2y - 4z)^7$ **(06 Marks)**

c. Using Catalan number find the possible way of arranging four 1's and four 0's such that in each arrangement the number of 0's never exceed the number of 1's. **(07 Marks)**

6 a. In how many ways can one distribute eight identical balls into four destined containers so that

i) No container is left empty?

ii) The fourth container gets and odd number of balls? **(06 Marks)**

b. In how many ways can the arrange the letter in the word CORRESPONDENTS so that

i) There is no pair of consecutive identical letters?

ii) There are exactly two pairs of consecutive identical letters?

iii) There are at least three pairs of consecutive identical letters? **(07 Marks)**

c. An apple, a banana, a mango and an orange are to be distributed for four boys B_1, B_2, B_3, B_4. The boys B_1, B_2 do not wish to have apple, the boy B_3 does not want banana or mange and B_4 refuses orange. In how many ways the distribution can be made so that no boy is disposed? **(07 Marks)**

7 a. Find a generating function for each of the following sequence

i) 1, 1, 0, 1, 1, 1 . . . . . . ii) 0, 2, 6, 12, 20, 30, 42, ... **(06 Marks)**

b. A bag contains a large number of red, green, white and black marbles, with at least 24 of each colour in how many ways can one select 24 of these marbles. So that there are even number of white marbles and at least six blacks marbles? **(07 Marks)**

c. A ship carries 48 flags, 12 each of the colours, red white, blue and black. Twelve of these flags are placed on a vertical pole in order to communicate a signal to other ships.

i) How many of these signals use an even number of blue flage and an odd number of black flags?

ii) How many of the signals have at least three white flags or no white flag at all? **(07 Marks)**

8 a. The number of viruses affected files in a system is 1000 (to start with) and this increase 250% every two hours. Use a recurrence relation to determine the number of viruses affected files in the system after one day. **(06 Marks)**

b. If $a_0 = 0$, $a_1 = 1$, $a_2 = 4$, and $a_3 = 37$ satisfy the recurrence relation $a_{n+2} + ba_{n+1} + ca_n = 0$ for $n \geq 0$. Determine the constants b and c and then solve the relation for a_n. **(07 Marks)**

c. Solve the recurrence relation

$a_{n+2} - 4a_{n+1} + 3a_n = -200, n \geq 0$

$a_0 = 3000, a_1 = 3300$ **(07 Marks)**

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10CS45

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Microprocessors

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. What is μp? Explain how data, address and control bus interconnect various system components. **(06 Marks)**
b. Explain the flags of 8086 processor using suitable examples. **(08 Marks)**
c. What is pipelining? How is it achieved in 8086? **(06 Marks)**

2 a. What are the advantages of memory paging? Illustrate the concept of paging with a neat diagram. **(10 Marks)**
b. Discuss the following addressing modes with examples:
(i) Direct (ii) Register (iii) Base plus Index (iv) Immediate (v) Scaled Indexed. **(10 Marks)**

3 a. Write Bubble sort program using 8086 assembly instruction. **(08 Marks)**
b. Describe the following instructions with suitable examples:
(i) PUSH (ii) MUL (iii) IN (iv) AAA. **(08 Marks)**
c. Bring out the importance of XLAT instruction using a suitable program. **(04 Marks)**

4 a. Explain the following assembler directives with examples:
(i) DB (ii) EXTRN (iii) PROC (iv) SEGMENT **(08 Marks)**
b. Differentiate between procedures and macros. **(04 Marks)**
c. Write an ALP using 8086 instruction to count the number of zeroes in a given 8 bit number and store the result in memory location 'Res'. **(08 Marks)**

PART – B

5 a. Explain the basic rules for using assembly language programming for 16 bit DOS applications with the help of examples of assembly level program. **(08 Marks)**
b. What is inline assembly? Explain its need. **(06 Marks)**
c. Write a program to convert ASCII to Binary. **(06 Marks)**

6 a. With a neat timing diagram explain memory read cycle. **(08 Marks)**
b. Explain how address demultiplexing is done in 8086 processor based systems. **(07 Marks)**
c. Explain the functions of the following pins of 8086 μp.
(i) Reset (ii) Ready (iii) ALE (iv) BHE (v) INTR **(05 Marks)**

7 a. Explain the concept of 3-to-8 line decoder with the help of a neat diagram in detail. **(08 Marks)**
b. What is flash memory? Explain how a flash memory is interfaced to 8086 μp. **(06 Marks)**
c. Differentiate between memory mapped I/O and I/O mapped I/O. **(06 Marks)**

8 a. With internal block diagram, explain 8254 PIT. Give two applications of 8254. **(08 Marks)**
b. Briefly explain the control word format of 8255 in I/O mode and BSR. Give the control word format to program port A and port C lower as input and port B and port C upper as outputs ports in mode O. **(12 Marks)**

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MATDIP401

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Advanced Mathematics – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Prove that the angle between two lines whose direction cosines are (l_1, m_1, n_1) and (l_2, m_2, n_2) is $\cos\theta = l_1l_2 + m_1m_2 + n_1n_2$ **(07 Marks)**

b. Find the value of K if the angle between the lines with direction ratios $-2, 1, -1$ and $1, -K, -1$ is $\frac{2\pi}{3}$. **(07 Marks)**

c. Find the projection of the line segment AB on CD where A = (3, 4, 5), B = (4, 6, 3), C = (−1, 2, 4), D = (1, 0, 5) **(06 Marks)**

2 a. Derive the equation of the plane in the intercept form $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$. **(07 Marks)**

b. Find the image of the point (2, −1, 3) in the plane $2x+4y+z-24=0$. **(07 Marks)**

c. Find the equation of the plane containing the line $\frac{x+1}{2}=\frac{y+2}{3}=\frac{z+3}{4}$ and is perpendicular to the line $x-2y+3z=4$. **(06 Marks)**

3 a. Show that the position vectors of the vertices of a triangle $2i-j+k$, $i-3j-5k$ and $3i-4j-4k$ form a right angled triangle. **(07 Marks)**

b. Find the cosine and sine of the angle between the vectors $2i-j+3k$ and $i-2j+2k$. **(07 Marks)**

c. Find the value of λ such that the vectors $\vec{a}=\lambda i-5j-2k$, $\vec{b}=-7i+14j-3k$ and $\vec{c}=11i+4j+k$ are coplanar. **(06 Marks)**

4 a. A particle moves along a curve $x=t^3-4t$, $y=t^2+4t$, $z=8t^2-3t^3$. Determine its velocity and acceleration and also the magnitude of velocity and acceleration at t = 2. **(07 Marks)**

b. Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point (2, −1, 2). **(07 Marks)**

c. Find the directional derivative of the function $\phi = xyz$ along the direction of the normal to the surface $xy^2+yz^2+zx^2=3$ at the point (1, 1, 1) **(06 Marks)**

5 a. If $\vec{F}=\nabla(x^3+y^3+z^3-3xyz)$ find div $\vec{F}$ and curl $\vec{F}$. **(07 Marks)**

b. Show that curl(gradϕ) = 0. **(06 Marks)**

c. Show that $\vec{F}=\frac{xi+yj}{x^2+y^2}$ is both solenoidal and irrotational. **(07 Marks)**

6 a. Find the Laplace transform of t^n, where n is a positive integer. **(05 Marks)**

b. Find $L(\sin 5t \cos 2t)$. **(05 Marks)**

c. Find $L(t\cos at)$. **(05 Marks)**

d. Find $L\left(\frac{\cos at - \cos bt}{t}\right)$. **(05 Marks)**

7 a. Find $L^{-1}\left[\frac{s+5}{s^2 - 6s + 13}\right]$. **(07 Marks)**

b. Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)(s+3)}\right]$. **(07 Marks)**

c. Find $L^{-1}\left[\log\left(\frac{s+a}{s+b}\right)\right]$. **(06 Marks)**

8 a. Using Laplace transform solve $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0 = y'(0)$ **(10 Marks)**

b. Using Laplace transform solve $\frac{dx}{dt} + y = \sin t$, $\frac{dy}{dt} + x = \cos t$ given $x(0) = 1$, $y(0) = 0$ **(10 Marks)**

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