Register Number:……………..

KUMARAGURU college of technology
character is life

MCA DEGREE EXAMINATIONS: JUNE 2018

(Regulation 2017)

First Semester

MASTER OF COMPUTER APPLICATIONS

P17MAT1101**:** Mathematics for Computer Applications

COURSE OUTCOMES

CO1: Analyse arguments and conclude whether they are logically valid .

CO2: Identify different types of grammars and design grammars to generate various languages.

CO3: Find eigen values and eigen vectors of real symmetric and non symmetric matrices and apply Cayley Hamilton theorem to find matrix inverse.

CO4: Analyze the consistency and solve a given system of linear equations .

CO5: Find the solution of non linear algebraic and transcendental equations by numerical methods.

CO6: Predict intermediate values of a tabulated function using suitable interpolation formulae

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Examine the two statements carefully and select the answer using the codes given below : CO1 [K_4]
Assertion (A): The premises "If it rains today, then the match will be cancelled" and "It rains today" lead to the conclusion "The match will be cancelled"
Reason (R): $p, p \to q \Rightarrow q$.

a) Both A and R are individually true and R is the correct explanation of A
b) Both A and R are individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

2. Match list I with list II and select the correct answer using the codes given below CO1 [K_2]

List I	List II
A. Universal specification	1. $(\forall x)(A(x)) \Rightarrow A(y)$
B. Existential specification	2. $A(y) \Rightarrow (\forall x)(A(x))$
C. Universal generalization	3. $(\exists x)(A(x)) \Rightarrow A(y)$
D. Existential generalisation	4. $A(y) \Rightarrow (\exists x)(A(x))$

a) A-1,B-2,C-3,D-4
b) A-2,B-1,C-4,D-3
c) A-3,B-1,C-2,D-4
d) A-1,B-3,C-2,D-4

3. The set of production rules $\{S \to 0S0/1S1,\ S \to 0/1/\varepsilon\}$ generates CO2 [K_2]

a)	Palindromes in 0 and 1	b)	Strings having equal number of 0's and 1's.
c)	Strings having equal number of 0's and 1's with the 0's before the 1's.	d)	Strings in 0's and 1's with an even number of 1's.

4. Write the correct sequence of steps for deriving the word aba^2 from the production rules : $S \to aS, S \to aB, B \to bC, C \to aC, C \to a$, starting with $S \to$ CO2 [K_4]
    1. aB
    2. abaC
    3. abC
    4. aba^2

a)	1-2-3-4	b)	1-3-2-4
c)	3-1-2-4	d)	3-2-1-4

5. Which of the following statements are true for a square matrix A, with eigenvalue λ and corresponding eigenvector X? CO3 [K_2]
    1. $AX = \lambda X$.
    2. λ is an eigenvalue of A^T.
    3. $|A - \lambda I| = 0$.
    4. λ^2 is an eigenvalue of A.

a)	Both A and R are Individually true and R is the correct explanation of A	b)	Both A and R are Individually true but R is not the correct explanation of A
c)	A is true but R is false	d)	A is false but R is true

6. The iterative method used to find the dominant eigen value of a matrix is CO3 [K_1]

a)	Newton Raphson method	b)	Power method
c)	Gauss-Seidel method	d)	False Position method

7. Match list I with list II for a system of linear equations and select the correct answer using the codes given below : CO4 [K_2]

List I	**List II**
A. Consistency of the system	1. Gauss Seidel method
B. Upper triangular matrix	2. Gauss Jordan method
C. Diagonal matrix	3. Gauss elimination method
D. Diagonally dominant system	4. Rouche's theorem

a)	A-1,B-2,C-3,D-4	b)	A-1,B-3,C-2,D-4
c)	A-4,B-3,C-2,D-1	d)	A-4,B-2,C-3,D-1

8.	Examine the two statements carefully and select the answer using the codes given below : Assertion (A): The inverse of a non-singular square matrix can be determined using Gauss-Jordan method. Reason (R): When the augmented matrix (A, I) is transformed using elementary row operations to (I, B), then $A^{-1} = B$. a) Both A and R are individually true and R is the correct explanation of A b) Both A and R are individually true but R is not the correct explanation of A c) A is true but R is false d) A is false but R is true	CO4	[K_4]
9.	Write the correct sequence of steps to solve a non-linear equation $f(x)=0$ using Regula-Falsi method: 1. Find the interval (a,b) in which the root lies. 2. Check whether the root lies in (a, x_0) or (x_0, b) and use the formula in that interval. 3. Find an approximate root using the formula $x_0 = \frac{af(b) - bf(a)}{b-a}$. 4. Continue till desired accuracy is attained. a) 1-2-3-4 b) 1-3-2-4 c) 2-1-3-4 d) 2-3-1-4	CO5	[K_2]
10.	Which of the following statements are true? 1. Newton's forward difference formula is used for interpolating near the beginning of the table. 2. Newton's backward difference formula is used for interpolating near the end of the table. 3. Newton's difference formulae can be used only for equal intervals. 4. Lagrange's formula can be used only for unequal intervals. a) 1,2,3 b) 1,2,4 c) 1,3,4 d) 2,3,4	CO6	[K_2]

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11.	Construct the truth table for $\neg(p \wedge q)$.	CO1	[K_3]
12.	Write in symbolic form : "All birds have wings".	CO1	[K_3]
13.	Deduce the language generated by the production rules $S \to aA,\ A \to bS,\ S \to \varepsilon$.	CO2	[K_5]
14.	Construct a grammar for the language $L = \{a^n b^{2n} : n \geq 1\}$.	CO2	[K_5]
15.	State Cayley-Hamilton theorem and mention one use of the theorem.	CO3	[K_4]
16.	Two of the eigen values of $A=\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ are 3 and 6. Find the eigen values of A^{-1}.	CO3	[K_3]

17.	If the rank of A= $\begin{pmatrix} 2 & 1 & -1 \\ 1 & 4 & 2 \\ 3 & 5 & k \end{pmatrix}$ is 2, then find k.		CO4	[K_4]
18.	Solve by Gauss elimination method: $3x + y = 2,\ x + 3y = -2$.		CO4	[K_3]
19.	Solve $e^x = 3x$ by fixed point iteration method, correct to two decimal places.		CO5	[K_3]
20.	Write Lagrange's inverse interpolation formula for the data $(x_0, y_0), (x_1, y_1), (x_2, y_2)$.		CO6	[K_2]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 350 words)

Q.No. 21 is Compulsory

21.	a)	Obtain the PDNF for $(P \wedge Q) \vee (\neg P \wedge Q) \vee (Q \wedge R)$	7	CO1	[K_4]
	b)	Show that S is a valid inference from the premises $P \to \neg Q,\ Q \vee R,\ \neg S \to P$ and $\neg R$	7	CO1	[K_5]
22.	a)	Design a grammar to generate $L = \{a^n b^n c^n : n \geq 1\}$ and generate the word $a^2 b^2 c^2$.	7	CO2	[K_5]
	b)	State pumping lemma for regular languages. Use it to prove that $L = \{a^n b^n : n \geq 1\}$ is not regular.	7	CO2	[K_5]
23.	a)	Find the eigenvalues and eigenvectors of $A = \begin{pmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{pmatrix}$.	7	CO3	[K_4]
	b)	Using Cayley – Hamilton theorem, find the inverse of $A = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 1 \\ 1 & 0 & -2 \end{bmatrix}$	7	CO3	[K_5]
24.	a)	Investigate for what values of λ, μ , the equations $x + y + z = 6,\ x + 2y + 3z = 10,\ x + 2y + \lambda z = \mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions.	7	CO4	[K_5]
	b)	Solve the following system of equations by Gauss – Seidel method : 28 x + 4y – z = 32; x + 3y + 10 z = 24; 2 x + 17 y + 4 z = 35.	7	CO4	[K_4]
25.	a)	Solve for a positive root of $x^3 = 6x - 4$, by Newton-Raphson method, correct to six decimal places.	7	CO5	[K_3]

			Marks	CO	K
	b)	From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46 and 63.	7	CO6	[K_5]

Age x:	45	50	55	60	65
Premium y:	114.84	96.16	83.32	74.48	68.48

			Marks	CO	K
26.	a)	Find the inverse of $A=\begin{pmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$ using Gauss- Jordan method.	7	CO4	[K_L]
	b)	Determine by Lagrange's method, the number of patients over 40 years, using the following data:	7	CO6	[K_4]

Age over (x) years:	30	35	45	55
Number (y) of patients:	148	96	68	34

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