Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Fourth Semester

U15MAT402: NUMERICAL METHODS AND STATISTICS

(Common to EEE/EIE)

COURSE OUTCOMES

CO1: Understand the concepts of numerical techniques for solving system of equations.

CO2: Represent the experimental results numerically and to integrate (or differentiate) numerical data.

CO3: Predict the system of dynamic behavior through solution of ordinary differential equations modeling the system.

CO4: Understand the concepts of statistical measures and to measure the relationship between two attributes.

CO5: Analyze random or unpredictable experiments and investigate important features of random experiments.

CO6: Construct probabilistic models for observed phenomena through distributions which play an important role in many engineering applications.

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Condition for convergence of Newton Raphson method is------- CO1 [K_4]

   a) $|f(x)\cdot f''(x)|<|f'(x)|^2$ b) $|f(x)\cdot f'(x)|<|f''(x)|^2$

   c) $|f(x)\cdot f''(x)|>|f'(x)|^2$ d) $|f(x)\cdot f'(x)|<|f''(x)|^2$

2. The power method will work satisfactorily only if the matrix has a ---------- eigen value. CO1 [K_4]

   a) Equal b) dominant

   c) Negative d) positive

3. In Trapezoidal rule, the accuracy of the result can be improved by ---------- the interval '*h*'. CO2 [K_3]

   a) increasing b) decreasing

   c) no change d) equal

4. Error in Simpson one-third rule is of the order…….. CO2 [K_3]

   a) h b) h^2

   c) h^3 d) h^4

5. Examine the two statements carefully and select the answer using the codes given below CO3 [K_5]

   Assertion(A): The first two terms of Taylor's series expansion are y(x)= $y_0 + \frac{h^2}{2!} y_0'$

   Reason(R): The first two terms of Taylor's series give Euler's formula.

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 number of consecutive values of y required to apply Milne's method is…… CO3 [K_5]

a) 2
b) 3
c) 4
d) 5

7. Write the correct sequence of steps to find the median of a frequency distribution CO4 [K_4]

1) Write the x values in ascending or descending order
2) Identify the median class.
3) Obtain the cumulative frequency.
4) Apply the formula.

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

8. If the correlation coefficient is equal to 1, then the angle between two lines of regression is CO4 [K_4]

a) 90°
b) 45°
c) 0°
d) 60°

9. Match list I with list II and select the answer using the codes given below CO5 [K_5]
Consider the random experiment of selecting a card from a standard pack of cards.

List I(Card)	List II (Probability of getting the card)
A) King	1) 4/13
B) Spade	2) 2/13
c) King of queen	3) 1/4
D) King of spade	4) 1/13

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

10. Which of the following are true CO6 [K_6]

1) In a normal distribution, mean = median = mode
2) If X follows Poisson distribution with parameter λ, then E(x) = λ and var(x) = $\sqrt{\lambda}$.
3) For a binominal distribution with n=6 and mean=2, the probability of success is 1/3.
4) For a standard normal variate, mean=0 and variance=1.

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

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

11. Obtain the iterative formula for finding the square-root of a positive number using Newton Raphson's method. CO1 [K_4]

12. Solve the system of equations by Gauss elimination method. CO1 [K_4]
x + y =10, 2x + y =15.

13. Write Newton's interpolation formula for unequal intervals. CO2 [K_3]

14. The mean of a Binomial distribution is 20 and S.D. is 4. Determine the parameters of the distribution. CO6 [K_6]

15. Solve $y' = -y$ at $y = 0.1$, given $y(0) = 1$ using Euler's formula. CO3 [K_5]

16. Write Milne's Predictor-Corrector formula. CO3 [K_5]

17. For a group of 100 candidates, the mean was found to be 40. Later on it was discovered that a value 45 was misread as 54. Find the correct mean. CO4 [K_4]

18. Given two regression lines $X + 2Y = 5$ and $2X + 3Y = 8$. Find the value of correlation coefficient. CO4 [K_4]

19. State the axioms of probability. CO5 [K_5]

20. A random variable X has the density function $f(x) = \frac{k}{1+x^2}, -\infty < x < \infty$. Determine the value of *k*. CO5 [K_5]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. i) A random variable *X* has the following probability distribution. (7) CO5 [K_5]

$X=i$	0	1	2	3	4	5	6	7
P_i	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Find(i) the value of *k*, (ii) $P(1.5 < X < 4.5 / X > 2)$ and (iii) the smallest value of α for which $P(X \le \alpha) > \frac{1}{2}$.

ii) Solve the system of equations using Gauss Seidal iteration method. (7) CO1 [K_4]

$8x - y + z = 18; 2x + 5y - 2z = 3; x + y - 3z = -6$

22. i) Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range of integration into 4 equal parts using (7) CO2 [K_3]

(1) Trapezoidal rule (2) Simpon's one-third rule.

ii) Using Lagrange's interpolation formula find $f(x)$ from the following table. Also find the value of $f(6)$. (7) CO2 [K_3]

x	1	2	3	4
y	2	4	8	16

23. i) From the following table, obtain the value of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at the point $x = 0.96$ (7) CO2 [K_3]

x	0.96	0.98	1	1.02	1.04
$y=f(x)$	0.7825	0.7739	0.7651	0.7563	0.7473

ii) For a triangular distribution $f(x)=\begin{cases} x & ,0<x\le 1 \\ 2-x, & 1\le x\le 2 \\ 0 & ,elsewhere \end{cases}$ find the mean and variance. (7) CO6 [K_6]

24. i) Using Taylor's series method compute $y(0.1)$ and $y(0.2)$ correct to 4 decimal places if $y(x)$ satisfies $y'=x+y, y(0)=1$. (7) CO3 [K_5]

ii) By applying the fourth order Runge-Kutta method find $y(0.1)$ from $y'=y-x, y(0)=2$ taking $h=0.1$. (7) CO3 [K_5]

25. i) The run taken by two cricket players A and B in 10 innings are as follows: Of these two players who is more consistent? (7) CO4 [K_4]

A	30	44	66	62	60	34	80	46	20	38
B	34	46	70	38	55	48	60	34	45	30

ii) From the following data find (i) the regression line of y on x (ii) the most likely marks in Statistics when marks in English are 30. (7) CO4 [K_4]

Marks in English x	25	28	35	32	31	36	29	38	34	32
Marks in Statistics y	43	46	49	41	36	32	31	30	33	39

26. i) From an urn containing 5 white and 5 black balls, 5 balls are transferred at random into an empty second urn from which one ball is drawn. This is found to be white. What is the probability that all the 5 balls transferred from the first urn are white? (7) CO5 [K_5]

ii) If X is a Poisson variate such that $P(X=2)=9P(X=4)+90P(X=6)$. Find the variance and $P(X>3)$. (7) CO6 [K_6]

27. i) Find the positive root of $x^4-x-10=0$ by Newton Raphson method. (7) CO1 [K_4]

ii) Find the dominant eigen value and eigen vector of the matrix $\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$ using power method. (7) CO1 [K_4]

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