SSR DEGREE COLLEGE (AUTONOMOUS) NIZAMABAD
SEM –I INTERNAL – II
M.SC. PHYSICS
(mathematical physics)
QUESTION BANK

I. Multiple Choice Questions

1. The bisection method is based on which theorem?
   A) Taylor's theorem B) Rolle's theorem C) Intermediate Value Theorem
   D) Mean Value Theorem
   Answer: C
2. The bisection method can be applied only if:
   A) f(x) is differentiable B) f(x) is continuous and changes sign in the interval
   C) f(x) is increasing D) f(x) is polynomial
   Answer: B
3. The forward difference quotient is used to approximate:
   A) Integration B) Second derivative C) First derivative D) Root of equation
   Answer: C
4. Central difference quotient is not suitable at:
   A) Boundary points B) Interior points C) Smooth functions D) Uniform data
   Answer: A
5. Central difference quotient gives better accuracy than forward difference because:
   A) It uses two step sizes B) It cancels even-order error terms
   C) It uses backward expansion only D) It requires smaller data
   Answer: B
6. Newton–Cotes formulas are obtained using:
   A) Taylor series B) Newton's interpolation C) Lagrange interpolation
   D) Finite differences
   Answer: C
7. Simpson's 1/3 rule requires the number of subintervals to be:
   A) Odd B) Prime C) Even D) Multiple of 3
   Answer: C
8. Simpson's 3/8 rule requires number of subintervals to be:
   A) Even B) Odd C) Multiple of 2 D) Multiple of 3
   Answer: D
9. Simpson's 3/8 rule is generally used when:
   A) Number of intervals is even B) Number of intervals is a multiple of 3

C) Function is discontinuous D) End points are unknown
Answer: B

10. The Taylor series method is mainly used to solve:
A) Algebraic equations B) Linear equations
C) Ordinary differential equations D) Partial differential equations
Answer: C
11. Muller's method fails mainly when
A. Roots are complex B. Initial approximations are poor
C. Function is polynomial D. Function is continuous
Answer: B
12. Muller's method can find
A. Only real roots B. Only rational roots C. Only irrational roots
D. Both real and complex roots
Answer: D
13. The two-point Gauss-Legendre quadrature is exact for polynomials up to degree
A) 1 B) 2 C) 3 D) 4
Answer: C
14. In Gaussian quadrature, the weights and nodes are chosen to
A) Minimize truncation error B) Simplify computations
C) Maximize degree of exactness D) Reduce round-off errors
Answer: C
15. How many initial approximations are required in the secant method?
a) One b) Two c) Three d) None
Answer: b
16. A second-rank tensor transforms with
A) One transformation matrix B) Two transformation matrices
C) Three matrices D) Determinant only
Answer: B) Two transformation matrices
17. Two tensors can be added if they have
A) Same magnitude B) Same rank and type
C) Same components D) Same units only
Answer: B) Same rank and type
18. The sum of two second-rank tensors is a
A) Scalar B) Vector C) Second-rank tensor D) Third-rank tensor
Answer: C) Second-rank tensor
19. The number of independent components of a symmetric second-rank tensor in 3 dimensions is
A) 3 B) 6 C) 9 D) 1
Answer: B

20. Which of the following is an example of an antisymmetric tensor in physics?
    A) Stress tensor B) Moment of inertia tensor C) Angular momentum tensor
    D) Metric tensor
    Answer: C

II. Fill in the blanks

1. Euler method requires only the ____ derivative of the function. First
2. Euler method is less accurate because it neglects ____ order terms. Higher
3. In fourth-order Runge–Kutta method, the number of intermediate slopes used is ____ Four
4. Runge–Kutta method uses ____ slopes to improve accuracy. Multiple
5. The weight factors in Gaussian quadrature are obtained from ____ polynomials. Orthogonal
6. The total error in numerical differentiation is the sum of ____ error and ____ error. Truncation, round-off
7. Regula–Falsi method is a combination of ____ and ____ methods. Bisection, Secant
8. Root finding methods are mainly applied to ____ equations. Nonlinear
9. Increasing the number of terms in Taylor series expansion ____ the accuracy. Increases
10. Taylor series method generally gives ____ accuracy than Euler's method. Higher
11. Contravariant tensor components are usually written with ____ indices. **Answer: upper**
12. The scalar product of a covariant and contravariant vector results in a ____. **Answer: scalar**
13. The conductivity of a crystal in solid-state physics is expressed as a __ tensor. **(second-order)**
14. In general relativity, gravitation is described using the __ tensor.**(metric / Einstein)**
15. A covariant tensor of second order transforms with the __ of the Jacobian matrix. **(square of the inverse)**
16. The transformation law ensures that tensor equations are __ independent. **(coordinate)**
17. 7.The metric tensor is denoted by ___
18. 8.In Cartesian coordinates, the metric tensor components are ————
19. Addition and subtraction of tensors do not affect their __ law. **Transformation**
20. Tensor addition is __ and associative.

III. Descriptive Questions

1. Solve an ODE using runge kutta forth order method
2. find a real root of the equation using bisection method correct to 3 decimal
3. explain addition ,subtraction and outer product of tensors
4. expain contraction and inner product of tensors
5. what are symmetric and anti symmetric tensors
6. what is Muller's method