

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022  
(Third Semester)

Branch – NUTRITION FOOD SERVICE MANAGEMENT & DIETETICS  
MATHEMATICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 1 = 10)

1. If  $x = \cos \theta + i \sin \theta$ , what is the value of  $(x - \frac{1}{x})$ ?  
a)  $2\cos\theta$                       b)  $2i\sin\theta$                       c)  $2\sin\theta$                       d)  $2i\cos\theta$
2.  $1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!} - \dots$  is the expansion of \_\_\_\_\_.  
a)  $\operatorname{cosec}\theta$                       b)  $\tan\theta$                       c)  $\sin\theta$                       d)  $\cos\theta$
3. Every \_\_\_\_\_ matrix satisfies its own characteristic equation.  
a) square                      b) similar                      c) diagonal                      d) skew-symmetric
4. The roots of the characteristic equation are called \_\_\_\_\_.  
a) eigenvalues                      b) eigenvectors  
c) unitary                      d) Orthogonal
5. \_\_\_\_\_ method is one of the direct method to solve simultaneous linear algebraic equations.  
a) Lagrange                      b) Newton  
c) Gauss elimination                      d) Jacobi
6. The \_\_\_\_\_ in Gauss-seidal method is rapid than in Gauss Jacobi method.  
a) constant                      b) convergence  
c) variable                      d) divergence
7. The process of finding the values outside the interval is called \_\_\_\_\_.  
a) central difference                      b) extrapolation  
c) Trapezoidal                      d) interpolation
8. If the values of the independent variable are not an equidistant intervals, \_\_\_\_\_ formula can be used.  
a) Lagrange                      b) Newton forward  
c) Newton backward                      d) Simpson
9. The systematic refinement of Richardson's method is called \_\_\_\_\_ method.  
a) Romberg                      b) Trapezoidal  
c) Simpson                      d) Newton
10. Simpsons method is most widely used for numerical \_\_\_\_\_,  
a) differentiation                      b) integration  
c) error                      d) division.

SECTION - B (25 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 5 = 25)

- 11 a) Express  $\cos 8\theta$  in terms of  $\sin\theta$ .  
(OR)  
b) If  $\frac{\sin\theta}{\theta} = \frac{5045}{5046}$ , show that  $\theta = 1^\circ 58'$  approximately.

Cont...

12 a) If  $A = \begin{pmatrix} 1 & 3 \\ 2 & 6 \end{pmatrix}$  show that  $A^n = 7^{n-1} \begin{pmatrix} 1 & 3 \\ 2 & 6 \end{pmatrix}$   
(OR)

b) Find the eigenvalues and eigenvectors of the matrix  $\begin{pmatrix} 3 & 2 \\ 2 & 3 \end{pmatrix}$

13 a) Solve by Gauss-elimination method:  
 $2x + y + 4z = 12$ ,  $8x - 3y + 2z = 20$ ,  $4x + 11y - z = 33$   
(OR)

b) Solve by Gauss-Jordan method:  
 $x + y + z = 9$ ,  $2x - 3y + 4z = 13$ ,  $3x + 4y + 5z = 40$

14 a) Use Newton's forward interpolation formula to find y when x = 142

x:	140	150	160	170	180
y:	3.685	4.854	6.302	8.076	10.225

(OR)

b) Use Newton's backward interpolation formula to find y when x = 84

x:	40	50	60	70	80	90
y:	184	204	226	250	276	304

15 a) Evaluate  $\int_0^5 \frac{dx}{4x+5}$  using trapezoidal rule with h = 0.5  
(OR)

b) Evaluate  $\int_0^{10} \frac{dx}{1+x^2}$  using Simpson one third rule.

**SECTION - C (40 Marks)**

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 8 = 40)

16 a) Expand  $\sin^7 \theta$  in a series of sines of multiples of  $\theta$ .  
(OR)

b) Find  $\lim_{\theta \rightarrow 0} \frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1}$

17 a) Use Cayley-Hamilton theorem to find  $A^{-1}$  for  $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$   
(OR)

b) Diagonalise the matrix  $A = \begin{pmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{pmatrix}$

18 a) Solve by Gauss-Jacobi method of iterations:  
 $27x + 6y - z = 85$ ,  $6x + 15y + 2z = 72$ ,  $x + y + 54z = 110$   
(OR)

b) Solve by Gauss-Seidal method:  
 $10x + 2y + z = 9$ ,  $x + 10y - z = -22$ ,  $-2x + 3y + 10z = 22$

19 a) Use Lagrange's formula to find f(x) corresponding to x = 27.

x:	14	17	31	35
f(x):	68.7	64.0	44.0	39.1

b) Apply Newton's divided difference formula, to find the value of f(8)

x:	4	5	7	10	11	13
f(x):	48	100	294	900	1210	2028

20 a) Evaluate  $\int_0^1 \frac{dx}{1+x}$  using Simpson's three eight rule.  
(OR)

b) From the table of values of x and y, find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  for x = 1.05

x:	1.00	1.05	1.10	1.15	1.20	1.25	1.30
y:	1.00000	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017

Z-Z-Z

END