14NDU12 / 14BCV08 / 14BCU08 / 14MBU16

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2018
(Second /Third/ Fourth Semester)

Common to Branches – NUTRITION, FOOD SERVICE MANAGEMENT & DIETETICS / BIOCHEMISTRY & MICROBIOLOGY

MATHEMATICS

Time : Three Hours   Maximum : 75 Marks

SECTION-A (20 Marks)
Answer ALL questions
ALL questions carry EQUAL marks   (10 x 2 = 20)

1 Write the characteristic equation of a matrix.

2 If the matrix B is similar to the matrix A, then prove that A and B have the same characteristic equation.

3 Write the expansion of tan $n\theta$ in powers of tan θ.

4 Show that the error involved in replacing $\frac{1}{6}(8 - \sin\theta - \sin 2\theta)$ by θ is approximately $\frac{1}{30}\theta^5$ if θ is small.

5 Show that (1, 2, 8), (0, 3, 4), (1, 1, 3) and (2, 0, 7) are the vertices of a parallelogram.

6 Find the angle between the planes $2x - y + z = 6$, $x + 2y + 2z = 3$.

7 Prove that $(1 + \Delta)(1 - \nabla) = 1$.

8 When Newton's backward interpolation formula is used?

9 When does Simpson's give exact result.

10 Write the Newton's forward difference formula to compute the derivatives.

SECTION - B (25 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks (5 x 5 = 25)

11 a Find the characteristic equation of A = $\begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ and show that the matrix A satisfies the characteristic equation.

OR

b Find the Eigen value and the Eigen vector of the matrix.

$$A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}.$$

12 a Express $\dfrac{\sin 6\theta}{\sin \theta}$ interms of cos θ.

OR

b Evaluate $\underset{x \to \frac{\pi}{2}}{\text{Lim}} \dfrac{\sin x + \cos 2x}{\cos^2 x}$.

13 a   Find the equation of the plane passing through the points (3, 1, 2), (3, 4, 4) an perpendicular to the plane $5x + y + 4z = 0$.

OR

   b   Find the equation of the plane through the point (1, -2, 3) and the intersection of the planes $2x - y + 4z = 7$ and $x + 2y - 3z + 8 = 0$.

14 a   Find the cubic polynomial $y(x)$ such that $y(0) = -5$, $y(1) = 1$, $y(2) = 9$, $y(3) = 25$, $y(4) = 55$, $y(5) = 105$.

OR

   b   Using Newton's forward interpolation formula, calculate $f(1.02)$ up to 3 decimal places in the table given below.

X :	1.0	1.1	1.2	1.3	1.4
f(x) :	0.841	0.891	0.932	0.964	0.985

15 a   From the following table values of x and y find dy/dx and d^2y/dx^2 at $x = 1.05$.

x :	1	1.05	1.1	1.15	1.2	1.25	1.3
y :	1	1.025	1.049	1.072	1.095	1.118	1.14

OR

   b   Using Newton's divided difference formula, find $f(4)$ given that $f(0) = 2$, $f(1) = 3$, $f(2) = 12$ and $f(15) = 3587$.

SECTION - C (30 Marks)
Answer any THREE Questions
ALL Questions Carry EQUAL Marks   (3 x 10 = 30)

16   Diagonalize the matrix $\begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

17   If α, β, γ be the roots of the equation $x^3 + px^2 + qx + p = 0$, prove that $\tan^{-1}\alpha + \tan^{-1}\beta + \tan^{-1}\gamma = n\pi$ radians except when $q = 1$.

18   A line makes angle α, β, γ, δ with the four diagonals of a cube. Prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \dfrac{4}{3}$.

19   Using Lagrange's interpolation formula, find $y(2)$ from the following data.

x :	0	1	3	4	5
y :	0	1	8	256	625

20   Dividing the range into 10 equal parts, find the value of $\int_0^{\pi} \sin x \, dx$ by (i) Trapezoidal rule (ii) Simpson's rule.