

**SECTION -C (30 Marks)**

Answer ALL questions

ALL questions carry EQUAL Marks

(5 x 6 = 30)

11. (a) Explain the components of time series with examples.

OR

- (b) Fit a straight line trend by the method of least squares to the following data .

Also draw graph for the identified trend.

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value	17	20	19	26	24	40	35	55	50	74	69

12. (a) Explain in detail about ratio-to-trend method with its limitations.

OR

- (b) Calculate seasonal indices by method of link relative methods to the following data.

Year	I quarter	II quarter	III quarter	IV quarter
2017	6	6.5	7.8	8.7
2018	5.4	7.9	8.4	7.3
2019	6.8	6.5	9.3	6.4
2020	7.2	5.8	7.5	8.5
2021	6.6	7.3	8.0	7.1

13. (a) From the following data construct an index for 2003 taking 2002 as base by the average of relatives method using (i) arithmetic mean and (ii) geometric mean for average relatives:

Commodity	Price in 2002 (Rs.)	Price in 2003 (Rs.)
A	50	70
B	40	60
C	80	90
D	110	120
E	20	20

OR

- (b) Explain in detail the methods involved in construction of index number.

14. (a) Explain in detail about consumer price index number.

OR

- (b) Calculate Fisher's ideal index from the following data and prove that it satisfies both the time reversal and factor reversal tests:

Commodity	2002		2003	
	Price	Expenditure	Price	Expenditure
A	8	80	10	120
B	10	120	12	96
C	5	40	5	50
D	4	56	3	60
E	20	100	25	150

15. (a) Discuss the various estimation methods of measurement of national income.

OR

- (b) Discuss in detail about the modern national income.

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2022  
(First Semester)

Branch – STATISTICS

MATHEMATICS – I

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(5 x 1 = 5)

1. If  $A = \begin{pmatrix} -2 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -1 \end{pmatrix}$ , then the eigen values of  $A^{-1}$  are \_\_\_\_.

- (i) -2, 3, -1      (ii)  $-\frac{1}{2}, \frac{1}{3}, -1$       (iii) 2, -3, 1      (iv) 4, 9, 1.

2. If two roots of the equation  $x^4 - 8x^3 + 18x^2 - 30x + 7 = 0$  are of the form  $\alpha + i\beta$  and  $\beta + i\alpha$  then the value of  $\alpha + \beta$  is \_\_\_\_.

- (i) -4      (ii) -8      (iii) 4      (iv) 8.

3. If  $y = \left(\frac{1}{ax+b}\right)$  then  $y_n = ?$

- (i)  $\frac{(-1)^n(n-1)!a^n}{(ax+(ii))^n}$       (ii)  $\frac{(-1)^{n-1}(n)!a^n}{(ax+(ii)^{n+1}}$       (iii)  $\frac{(-1)^n(n+1)!a^n}{(ax+(ii)^{n+1}}$       (iv)  $\frac{(-1)^n(n)!a^n}{(ax+(ii)^{n+1}}$

4. When  $\frac{dy}{dx} = 1$ ,  $\frac{d^2y}{dx^2} = 2$ , the curvature =?

- (i)  $\frac{1}{\sqrt{2}}$       (ii)  $\sqrt{2}$       (iii)  $2\sqrt{2}$       (iv) 2.

5.  $\int_0^{\frac{\pi}{2}} \cos^7 x \, dx = ?$

- (i)  $\frac{5}{32}$       (ii)  $\frac{35}{16}$       (iii)  $\frac{5\pi}{32}$       (iv)  $\frac{16}{35}$

SECTION -B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks

(5 x 3 = 15)

6.a) If  $A = \begin{pmatrix} 2+i & 3 & -1+3i \\ -5 & i & 4-2i \end{pmatrix}$ , show that  $A^*A$  is a Hermitian matrix where  $A^*$  is the conjugate transpose of A.

OR

b) Find the eigen values and eigen vectors of the matrix  $\begin{pmatrix} 3 & 4 \\ 4 & -3 \end{pmatrix}$ .

7.a) Obtain the equation, one of its roots is  $\sqrt{3} + \sqrt{5}$ .

OR

b) Transform the equation  $x^4 + x^3 - 3x^2 + 2x - 4 = 0$  whose roots are diminished by 2.

Cont...