SECOND REVISION EXAMINATION - 2023	Reg. No.							
XI - BUSINESS MATHEMATICS & STATISTICS								
Time Allowed : 3:00 Hrs.							*Maximum Marks: 90*	

PART - I

Note ***i)*** ***Answer all the questions***
ii) ***Choose the most appropriat answer from the given four alternatives and write the option code and the corresponding answer.*** ***(20×1=20)***

1. The value of x if $\begin{vmatrix} 0 & 1 & 0 \\ x & 2 & x \\ 1 & 3 & x \end{vmatrix} = 0$ is _____

   a) -1,1 b) 0, - 1 c) -1, -1 d) 0, 1

2. The co-factor of -7 on the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ is _____

   a) -7 b) -18 c) 7 d) 18

3. The value of n, when $np_2 = 20$ is _____

   a) 5 b) 3 c) 4 d) 6

4. The number of permutation of n different things taken r at a time, when the repetition is allowed is _____

   a) $\frac{n!}{(n-r)!}$ b) r^n c) $\frac{n!}{(n+r)!}$ d) n^r

5. The x - intercept of the straight line 3x + 2y - 1 = 0 is _____

   a) $\frac{1}{3}$ b) 3 c) $\frac{1}{2}$ d) 2

6. (1, -2) is the centre of the circle $x^2 + y^2 + ax + by - 4 = 0$ then its radius _____

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

7. The degree measure of $\frac{\pi}{8}$ is _____

   a) 22°60' b) 20°60' c) 20°30' d) 22°30'

8. The radian measure of 37°30' is _____

   a) $\frac{7\pi}{24}$ b) $\frac{5\pi}{24}$ c) $\frac{9\pi}{24}$ d) $\frac{3\pi}{24}$

9. If $f(x) = \begin{cases} x^2 - 4x, & \text{if } x \geq 2 \\ x + 2, & \text{if } x < 2 \end{cases}$ then, f(0) is _____

   a) -1 b) 2 c) 0 d) 5

10. Which of the following function is neither even nor odd?

    a) $f(x) = x^{10}$ b) $f(x) = x^3 + 5$
    c) $f(x) = x^2$ d) $f(x) = x^5$

11. If y = x and $z = \frac{1}{x}$ then $\frac{dy}{dz}$ = _____

    a) $-x^2$ b) x^2 c) $-\frac{1}{x^2}$ d) 1

12. If the demand function is said to be eleastic, then _____

a) $|\eta_d| < 1$ b) $|\eta_d| > 1$

c) $|\eta_d| = 0$ d) $|\eta_d| = 1$

13. Relationship among MR, AR and η_d is _____

a) MR = AR = η_d b) $\eta_d = \frac{AR}{AR - MR}$ c) $AR = \frac{MR}{\eta_d}$ d) η_d = AR - MR

14. Purchsing price of one share of face value ₹100 available at a discount of $9\frac{1}{2}\%$ with brokerage $\frac{1}{2}\%$ is _____

a) ₹91 b) ₹89 c) ₹95 d) ₹90

15. If Median = 45 and its coefficient is 0.25, then the mean deviation about median is ____

a) 0.0056 b) 11.25 c) 45 d) 180

16. The probability of obtaining even prime number on each die, when a pair of dice is rolled is _____

a) $\frac{1}{3}$ b) $\frac{1}{36}$ c) $\frac{1}{6}$ d) 0

17. If the outcome of one event does not influence another event then the two events are _____

a) Not disjoint b) Mutually exclusive c) Independent d) Dependent

18. If the values of two variables move in opposite direction then the correlation is said to be _____

a) Perfect positive b) Negative c) No correction d) Positive

19. Example for positive correlation is _____

a) Repayment period and EMI b) Income and expenditure

c) Weight and Income d) Price and demand

20. One of the conditions for the activity (i, j) to lie on the critical path is _____

a) Ej - Ei = Lj - Li = tij b) Ei - Ej = Lj - Li = tij

c) Ej - Ei = Li - Lj ¹ tij d) Ej - Ei = Lj - Li = tij

PART - II

Answer any seven questions. Question Number 30 is compulsory.

(7x2=14)

21. Evaluate $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix}$

22. Evaluate. i) $8P_3$ ii) $5P_4$

23. Find the acute angle between the line 2x - y + 3 = 0 and x + y + 2 = 0

24. Show that. $\frac{\sin 2\theta}{1+\cos 2\theta} = \tan\theta$

25. Evaluate. $\lim_{x \to 2} \frac{x^3+2}{x+1}$

26. The total cost function for the production of x units of an item is given by $C(x) = \frac{1}{3}x^3 + 4x^2 - 25x + 7$ Find (i) Average cost function (ii) Average variable cost function.
27. What is the amount of perpetual annuity of ₹50 at 5% compound interest per year?
28. Define : Baye's Theorem.
29. From the following data calculate the correlation coefficient
$\Sigma xy = 120$, $\Sigma x^2 = 90$, $\Sigma y^2 = 640$
30. Find the equation of the circle with centre at origin and radius is 3 units.

PART - III

Answer any 7 questions. Question Number 40 is compulsory. ***(7x3=21)***

31. Solve by using matrix inversion method. $2x + 5y = 1$, $3x + 2y = 7$
32. Find the number of arrangements that can be made out of the letters of the word "ASSASSINATION".
33. Find the centre and radius of the circle $x^2 + y^2 - 8x + 6y - 24 = 0$.
34. Prove that $\frac{\sin(-\theta)\tan(90°-\theta)\sec(180°-\theta)}{\sin(180°+\theta)\cot(360°-\theta)\operatorname{cosec}(90°-\theta)} = 1$
35. Find $\frac{dy}{dx}$ for the function $x^2 - xy + y^2 = 7$.
36. If $z = (ax + b)(cy + d)$, then find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.
37. Find the annual rate of interest, to get a perpetuity of ₹675 for very half yearly from the present value of ₹30,000.
38. Calculate Harmonic Mean for the following data given below.

Value	0-10	10-20	20-30	30-40	40-50
Frequency	8	12	20	6	4

39. Calculate the correlation coefficient from the following data
$N=9$, $\Sigma x = 45$, $\Sigma y = 108$, $\Sigma x^2 = 285$, $\Sigma y^2 = 1356$, $\Sigma xy = 597$
40. Solve. $\begin{vmatrix} x-1 & x & x-2 \\ 0 & x-2 & x-3 \\ 0 & 0 & x-3 \end{vmatrix} = 0$

PART - IV

Answer all the questions. ***(7x5=35)***

41. a) If $A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -1 \\ 1 & 2 \end{bmatrix}$ then, show that $(AB)^{-1} = B^{-1}A^{-1}$ **(OR)**

b) By the principle of Mathematical Induction, prove that
$1 + 3 + 5 + \ldots\ldots\ldots + (2n - 1) = n^2$ for all $n \in N$.

42. a) Find the axis, vertex, focus, equation of directrix and the length of latus rectum for the parabola $x^2 + 6x - 4y + 21 = 0$ **(OR)**

b) Prove that $\tan^{-1}\left(\frac{1}{7}\right)+\tan^{-1}\left(\frac{1}{13}\right)=\tan^{-1}\left(\frac{2}{9}\right)$

43. a) Differentiate $\sin^3 x$ with respect to $\cos^3 x$. **(OR)**

b) The demand for a quantity A is $q = 13 - 2P_1 - 3P_2^2$. Find the partial elasticities $\frac{Eq}{EP_1}$ and $\frac{Eq}{EP_2}$ when $P_1 = P_2 = 2$.

44. a) A man buys 500 shares of face value ₹100 at ₹14 below par. How much money does he pay? **(OR)**

b) Calculate the quartile deviation and its coefficient from the following data

Age in years	20	30	40	50	60	70	80
No. of members	13	61	47	15	10	18	36

45. a) X speaks truth 4 out of 5 times. A die is thrown. He reports that there is a six. What is the chance that actually there was a six? **(OR)**

b) The following are the ranks obtained by 10 students in statistics and Mathematics.

Statistics	1	2	3	4	5	6	7	8	9	10
Mathematics	1	4	2	5	3	9	7	10	6	8

Find the rank correlation coefficient.

46. a) Compute the earliest start time, earliest finish time, latest start time and latest finish time of each activity of the project given below.

Activity	1 - 2	1 - 3	2 - 4	2 - 5	3 - 4	4 - 5
Duration	8	4	10	2	5	3

(OR)

b) Resolve into partial fractions. $\frac{4x+1}{(x-2)(x+1)}$

47. a) Let $U = x^2y^3\cos\left(\frac{x}{y}\right)$. By using Euler's theorem. Show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=5u$.

(OR)

b) Suppose the inter - industry flow of the product of two sectors X and Y are given as under.

Production sector	Consumption sector		Domestic demand	Gross output
	X	Y		
X	15	10	10	35
Y	20	30	15	65

Find the gross output when the domestic demand changes to 12 for X and 18 for Y.