

Class : 11 HALF YEARLY COMMON EXAMINATION - 2022-23 **Register Number**

BUSINESS MATHEMATICS AND STATISTICS

Time Allowed : 3.00 Hours **[Max. Marks : 100]**

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*Register
Number*

[Max. Marks : 90]

PART -A

$$20 \times 1 = 20$$

I. Answer All the questions.

20x1-20

Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

10. The number of Hawkins - Simon conditions for viability of an input - output analysis is -----

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If $\begin{vmatrix} x & 2 \\ 8 & 5 \end{vmatrix} = 0$ then the value of x is -----

$$(a) \frac{-5}{6} \quad (b) \frac{5}{6} \quad (c) \frac{-16}{5}$$

(a) $10C_4 \left(\frac{1}{x} \right)$ (b) ~~$10C_5$~~ (c) $10C_6$ (d) $10C_7 x^4$

- The total number of 9 digit numbers which have all different digits is -----

(a) $10!$ (b) $9!$ (c) ~~$9 \times 9!$~~ (d) $10 \times 10!$

If $kx^2 + 3xy - 2y^2 = 0$ represent a pair of lines which are perpendicular then k is equal to -----

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

The double ordinate passing through the focus is -----

(a) focal chord (b) latus rectum (c) directrix (d) axis

7. The value of $\sin 15^\circ$ is -----

(a) $\frac{\sqrt{3} + 1}{2\sqrt{2}}$ (b) $\frac{\sqrt{3} - 1}{2\sqrt{2}}$ (c) $\frac{\sqrt{3}}{\sqrt{2}}$ (d) $\frac{\sqrt{3}}{2\sqrt{2}}$

8 If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$ then $\tan(2A + B)$

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

9. The value of $\sin 63^\circ \cos 27^\circ + \cos 63^\circ \sin 27^\circ$ is -----.

a) $\frac{1}{\sqrt{2}}$ b) 1 c) $\frac{-1}{\sqrt{2}}$ d) 0

10. The graph of $y = e^x$ intersect the y-axis at -----

a) $(0, 0)$ b) $(1, 0)$ c) $(0, 1)$ d) $(1, 1)$

$$\lim_{x \rightarrow 0} \frac{e^x - 1}{x} = \dots$$

(17) $\lim_{x \rightarrow 0} x^n$

(c) 1 (d) 0

12. If $y = x^2$ and $z = -x^2$ then find $\frac{dy}{dz} =$

- (a) x^2 (b) 1

(c) $-x^2$

(d) -1

$$\frac{dy}{dx}, \frac{dz}{dx} \\ \frac{dy}{dx} = \frac{1}{-2x}$$

13. Instantaneous rate of change of $y = 2x^2 + 5x$ with respect to x at $x = 2$ is -----

- a) 4 b) 5

c) 13

d) 9

14. The demand function is always

- (a) Increasing function
(c) Non decreasing function

(b) Decreasing function

(d) Undefined function

15. The % of income on 7% stock at ₹.80 is -----

- (a) 9% (b) 8.75%

(c) 8%

(d) 7%

16. The best measure of central tendency is -----

- (a) Arithmetic mean (b) Harmonic mean (c) Geometric mean (d) Median

17. Probability of an impossible event is -----

- (a) 1 (b) 0 (c) 0.2 (d) 0.5

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

- (a) Negative (b) Positive (c) Perfect positive (d) Perfect Negative

19. The correlation coefficient -----

- (a) $r = \pm \sqrt{b_{xy} \times b_{yx}}$ (b) $r = \frac{1}{b_{xy} \times b_{yx}}$ (c) $r = b_{xy} \times b_{yx}$ (d) $r = \pm \sqrt{\frac{1}{b_{xy} \times b_{yx}}}$

20. The minimum value of the objective function $z = x + 3y$ subject to constraints $2x + y \leq 20$,

$x + 2y \leq 20$, $x > 0$ and $y > 0$ is -----

- (a) 10 (b) 20 (c) 0 (d) 5

PART - B

Note : Answer any 7 questions from which Q.No.30 is compulsory.

7x2=14

21. Find $|AB|$ if $A = \begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ 1 & -2 \end{bmatrix}$

22. Expand $(98)^3$ using binomial theorem

23. Find the length of tangent from the point $(2,3)$ to the circle $x^2 + y^2 + 8x + 4y + 8 = 0$

24. Find the value of $\tan 75^\circ$

25. Find the elasticity of supply for the supply function $x = 2p^2 - 5p + 1$, $p > 3$

26. What is the amount of perpetual annuity of ₹ 50 at 5% compound interest per year?

27. A die is thrown. Find the probability of getting (i) prime number (ii) a number greater than or equal to 3

28. From the following data, calculate the correlation coefficient $\Sigma xy = 120$; $\Sigma x^2 = 90$; $\Sigma y^2 = 640$.

29. Draw the event oriented network for the following data:

Events	1	2	3	4	5	6	7
Immediate Predecessors	-	1	1	2,3	3	4,5	5,6

30. Differentiate with respect to x : $x e^x$

PART - C

Note: Answer any 7 questions from which Q.No. 40 is compulsory.

7x3=21

31. Show that the matrices $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4/35 & 11/35 & -5/35 \\ -1/35 & -6/35 & 25/35 \\ 6/35 & 1/35 & -10/35 \end{bmatrix}$ are inverses of each other.
32. If $nP_r = 1680$ and $nC_r = 70$ find n and r .
33. Find the angle between the pair of straight lines $3x^2 - 5xy - 2y^2 + 17x + y + 10 = 0$
34. Prove that $\sin 600^\circ \cdot \cos 390^\circ + \cos 480^\circ \cdot \sin 150^\circ = -1$
35. Evaluate : $\lim_{x \rightarrow a} \frac{x^{3/5} - a^{3/5}}{x^{1/5} - a^{1/5}}$
36. Find the stationary value and the stationary points $f(x) = x^2 + 2x - 5$
37. Find the amount of an ordinary annuity of ₹ 3200 per annum for 12 years at the rate of interest of 10% per year. $[(1.1)^2 = 3.1384]$
38. The following are the ranks obtained by 10 students in commerce and accountancy are given below.

Commerce	6	4	3	1	2	7	9	8	10	5
Accountancy	4	1	6	7	5	8	10	9	3	2

To what extent is the knowledge of students in two subjects related?

39. Construct a network diagram:

A, B, C can start simultaneously A < F, E; B < D, C; E, D < G

40. Find Q_2, D_5, P_{50} for data: 12, 15, 20, 28, 30, 40, 50.

PART - D

Answer all the questions.

7x5=35

41. a) The cost of 4 kg onion, 3 kg wheat and 2 kg rice is ₹ 320. The cost of 2 kg onion, 4 kg wheat, and 6 kg rice is ₹ 560. The cost of 6 kg onion, 2 kg wheat and 3 kg rice is ₹ 380. Find the cost of each item per kg by matrix inversion method.

(OR)

- b) Prove that $\frac{\sin(B-C)}{\cos B \cos C} + \frac{\sin(C-A)}{\cos C \cos A} + \frac{\sin(A-B)}{\cos A \cos B} = 0$

42. a) Suppose the inter-industry flow of the product of two industries are given as under.

Production sector	Consumption Sector		Domestic Demand	Total Output
	X	Y		
X	30	40	50	120
Y	20	10	30	60

Determine technology matrix. If the domestic demand changes to 80 and 40 units respectively. What should be the gross output of each sector in order to meet the new demands.

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(OR)

b) If $x^3 + y^3 = 3axy$, then find $\frac{dy}{dx}$.

43. a) Resolve into partial fractions: $\frac{x+2}{(x-1)(x+3)^2}$

(OR)

b) Solve the following LPP by graphical method Minimize $Z = 5x_1 + 4x_2$ subject to constraints
 $4x_1 + x_2 \geq 40$, $2x_1 + 3x_2 \geq 90$ and $x_1, x_2 \geq 0$

44. a) Find the equation of the circle which passes through the points $(1, 0)$, $(-1, 0)$ and $(0, 1)$

(OR)

b) Find the coefficient of correlation.

X	35	40	60	79	83	95
Y	17	28	30	32	38	49

45. a) Solve $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$

(OR)

b) A company has three machines A, B, C which produces 20%, 30% and 50% of product respectively. Their respective defective % are 7, 3 and 5. From these products one is chosen, if it is defective what is the probability that it has been made by machine C?

46. a) If $y = 500 e^{7x} + 600 e^{-7x}$, then show that $y^2 - 49y = 0$

(OR)

b) Obtain the regression line of Y on X from the following data:

X	1	2	3	4	5	6	7
Y	9	8	10	12	11	13	14

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

(OR)

b) A man invest ₹ 96,000 on ₹ 100 shares at ₹ 80. If the company pays him 18% as dividend, find

- i) the number of shares he bought
- ii) the dividend
- iii) percentage of return