TVL11BM

Common Half Yearly Examination - December 2025

Standard 11

Time Allowed: 3.00 Hours **BUSINESS MATHS** Maximum Marks: 90

I. Choose the correct answer: **20×1=20**

1) The cofactor of −7 in the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ is

a) −18 b) 18 c) −7 d) 7

2) The inverse of $\begin{matrix} 2 & -1 \\ -5 & 3 \end{matrix}$ is

a) $\begin{matrix} -2 & 5 \\ 1 & -3 \end{matrix}$ b) $\begin{matrix} 3 & -1 \\ -5 & -3 \end{matrix}$ c) $\begin{matrix} -3 & 5 \\ 1 & -2 \end{matrix}$ d) $\begin{matrix} 3 & 1 \\ 5 & 2 \end{matrix}$

3) The term containing x^3 in the expansion of $(x-2y)^7$ is

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

4) The constant term in the expansion of $\left(x + \frac{2}{x}\right)^6$ is

a) 156 b) 165 c) 162 d) 160

5) If m_1 and m_2 are the slopes of the pair of lines given by $ax^2+2hxy+by^2 = 0$ then the value of m_1+m_2 is

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

6) In the equation of the circle $x^2+y^2 = 16$ then y intercept is (are)

a) 4 b) 16 c) ±4 d) ±16

7) The value of sin 28° cos 17° + cos 28° sin 17°

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

8) The value of $\frac{1}{\text{cosec}(-45°)}$ is

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

9) If $f(x) = \frac{1-x}{1+x}$; $x > 0$, then $f(-x)$ is equal to

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

10) $\frac{d}{dx}\ \frac{1}{x}$ =

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

11) marginal revenue of the demand function P = 20−3x is

a) 20−6x b) 20−3x b) 20+6x d) 20+3x

12) If $u = 4x^2+4xy+y^2+4x+32y+16$, then $\frac{\partial^2 u}{\partial y \partial x}$ is equal to

a) $8x+4y+4$ b) 4 c) $2y+32$ d) 0

13) What is the amount realised on selling 8% stock of 200 shares of face value Rs. 100 at Rs.50

a) Rs.16000 b) Rs.10000 c) Rs.7000 d) Rs.9000

14) The geometric mean of two numbers 8 and 18 shall be

a) 12 b) 13 c) 15 d) 11.08

15) The mean of the values 16, 17, 18, 19 and 20 is

a) 17 b) 17.5 c) 18.5 d) 18

16) Probability of an impossible event is

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

17) The correlation coefficient from the following data $N = 25$, $\Sigma X = 125$, $\Sigma Y = 100$, $\Sigma X^2 = 650$, $\Sigma Y^2 = 436$, $\Sigma XY = 520$

a) 0.667 b) −0.006 c) −0.667 d) 0.70

18) If cov (x, y) = −16.5, $\sigma_x^2 = 2.89$, $\sigma_x^2 = 100$. Find correlation coefficient

a) −0.12 b) 0.001 c) −1 d) −0.97

19) The maximum value of the objective function $z = 3x+5y$ subject to the constraints $x \geq 0$, $y \geq 0$ and $2x+5y \leq 10$ is

a) 6 b) 15 c) 25 d) 31

20) If the two lines are perpendicular, then

a) $m_1 = m_2$ b) $m_1 = -m_2$ c) $m_1 m_2 = -1$ d) $m_1 m_2 \neq -1$

II. Answer any seven questions Q.N. 30 is compulsory: **7×2=14**

21) Solve $\begin{vmatrix} 2 & x & 3 \\ 4 & 1 & 6 \\ 1 & 2 & 7 \end{vmatrix} = 0$

22) Find the number of arrangements that can be made out of the letters of the word "ASSASINATION"

23) Find the centre and radius of the circle $x^2+y^2-8x+6y-24 = 0$

24) Find the value of $\tan(-1215°)$

25) If $f(x) = x^3 - \frac{1}{x^3}$, $x \neq 0$, then show that $f(x)+f\left(\frac{1}{x}\right) = 0$

26) For the given demand function $p = 40-x$, find the output when $\eta_d = 1$

27) Find the market value of 62 shares available at Rs.132 having the par value of Rs.100

28) An aeroplane flies along the four sides of a square at speeds of 100, 200, 300 and 400 kilometers per hour respectively. What is the average speed of the plane in its flight around the square.

29) Draw the network for the project whose activities with their relationships are given below.
Activites A, D, E can start simultaneously: B, C > A, G, F > D, C ; H > E, F

30) The regression coefficient values are $b_{yx} = \frac{2}{3}$, $b_{xy} = \frac{1}{4}$, find the correlation coefficient.

III. Answer any seven questions Q.N. 40 is compulsory: **7×3=21**

31) If $A = \begin{matrix} 2 & -2 & 2 \\ 2 & 3 & 0 \\ 9 & 1 & 5 \end{matrix}$, then show that (adj A)A = 0

32) Resolve into partial fractrions $\frac{7x-1}{x^2-5x+6}$

33) Prove that $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{2}{11}\right)=\tan^{-1}\left(\frac{3}{4}\right)$

34) Evaluate: $\lim_{n\to\infty}\frac{n^2}{n^3}$

35) If $u = x^2(y-x) + y^2(x-y)$, then show that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y} = \bullet - 2(x-y)^2$

36) A person pays Rs.64000 per annum for 12 years at the rate of 10% per year. Find the amount of an ordinary annuity $[(1.1)^{12} = 3.3184]$

37) A can solve 90 percent of the problems given in a book and B can solve 70 percent. What is the probability that atleast one of them will solve a problem selected at random?

38) Find the locus of the point which is equidistant from (2, −3) and (3, −4)

39) 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

40) Find the value of 'a' which the straight lines $3x+4y = 13$, $2x-7y = -1$ and $ax-y-14 = 0$ are concurrent.

IV. Answer all the questions: **7×5=35**

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

(OR)

If $u = xy+\sin(xy)$, then showthat $\frac{\partial^2 u}{\partial x\partial y} = \frac{\partial^2 u}{\partial y\partial x}$

42) Solve by matrix inversion method:
$x-y+2z = 3$, $2x+z = 1$, $3x+2y+z = 4$

(OR)

Obtain regression equation of y and x and estimate y when x = 55 from the following

X	40	50	38	60	65	50	35
Y	38	60	55	70	60	48	30

43) By Mathematical induction, prove that $1^2+2^2+3^2+\ldots\ldots+n^2 = \frac{n(n+1)(2n+1)}{6}$ for all the $n \in N$

(OR)

If $x\sqrt{1+y}+y\sqrt{1+x} = 0$ and $x \neq y$ then prove that $\frac{dy}{dx} = \frac{-1}{(x+1)^2}$

44) Show that the middle term in the expansion of $(1+x)^{2n}$ is $\frac{1.3.5\ldots\ldots(2n-1)2^n x^n}{n!}$

(OR)

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

45) Show that the equation $2x^2+7xy+3y^2+5x+5y+2 = 0$ represent two straight lines and find their seperate equations.

(OR)

Find the correlation coefficient of the following data:

X	25	18	21	24	27	30	36	39	42	48
Y	26	35	48	28	20	36	25	40	43	39

46) Find the vertex, focus, axis, directrix and the length of latus rectum of the parabola $y^2-8y-8x+24 = 0$

(OR)

A photographer purchases a camera on istallments. He has to pay 7 annual installments each of Rs.36000 right from the date of purchase. If the rate of compound interest is 16% then find the cost price (present value) of the camera $[(1.16)^7 = 2.828]$

47) Prove that $\sin 20° \sin 40° \sin 60° \sin 80° = \frac{3}{16}$

(OR)

The following table use the activities in a construction projects and relevant information:

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Duration (in days)	22	27	12	14	6	12

Draw the network for the project, calculate the earliest start time, earliest finish time, latest start time and latest finish time of each activity and find the critical path. Compute the project duration.

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