COMMON QUARTERLY EXAMINATION - SEPTEMBER 2019

STANDARD - XI Reg. No. | | | | | | |

Time : 2.30 hours **BUSINESS MATHEMATICS & STATISTICS** *Marks: 90*

Instructions: 1. Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately. 2. Use Blue or Black ink to write and underline and pencil to draw diagrams.

PART - I

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

1) The inverse matrix of $\begin{bmatrix} \frac{4}{5} & \frac{-5}{12} \\ \frac{-2}{5} & \frac{1}{2} \end{bmatrix}$

a) $\frac{30}{7}\begin{bmatrix} \frac{1}{2} & \frac{5}{12} \\ \frac{2}{5} & \frac{4}{5} \end{bmatrix}$ b) $\frac{7}{30}\begin{bmatrix} \frac{1}{2} & \frac{5}{12} \\ \frac{2}{5} & \frac{4}{5} \end{bmatrix}$ c) $\frac{7}{30}\begin{bmatrix} \frac{1}{2} & \frac{5}{12} \\ \frac{-2}{5} & \frac{1}{5} \end{bmatrix}$ d) $\frac{30}{7}\begin{bmatrix} \frac{1}{2} & \frac{-5}{12} \\ \frac{-2}{5} & \frac{4}{5} \end{bmatrix}$

2) If $A = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ then $|2A|$ is equal to

a) $4\cos 2\theta$ b) 2 c) 4 d) 1

3) If n is the order of the matrix A, then $|adjA|$ =

a) $|A|$ b) $|A|^{n-1}$ c) $|A|^{n+1}$ d) $|A|^n$

4) The inventor of input - output analysis is

a) Sir Francis Galton b) Fisher c) Arthur Caylay d) Prof. Wassily W. Leontief

5) For all positive integer n, $nC_1 + nC_2 + nC_3 + \ldots\ldots\ldots + nC_n$ =

a) 2^n b) n^2 c) $2^n - 1$ d) $n^2 - 1$

6) If $\frac{kx}{(x+4)(2x-1)} = \frac{4}{x+4} + \frac{1}{2x-1}$ then k =

a) 9 b) 11 c) 5 d) 7

7) The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of there parallel lines is

a) 12 b) 9 c) 6 d) 8

8) The number of diagonals that can be drawn by joining the angular points of octagon is

a) 22 b) 20 c) 24 d) 26

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

a) 2h/b b) -2h/a c) -2h/b d) 2h/a

10) The equation of the circle with centre on the x- axis and passing through the origin is

a) $x^2 - 2ax + y^2 - 0$ b) $y^2 - 2ay + x^2 = 0$ c) $x^2 + y^2 = a^2$ d) $x^2 - 2ay + y^2 = 0$

11) The double ordinate passing through the focus is

a) Latus return b) focal chord c) directrix d) axis

12) Who is the father of Analytical Geometry?

a) Seki Kowa b) G.W. Leibnitz
c) Rene Descartes d) Sir Issac Newton

13) The value of $\sin 15^\circ$ is

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

14) The value of $\frac{3\tan 10^\circ - \tan^3 10^\circ}{1-3\tan^2 10^\circ}$ is

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

15) If α and β be between 0 and $\frac{\pi}{2}$ and if $\cos(\alpha+\beta) = \frac{12}{13}$ and $\sin(\alpha-\beta) = \frac{3}{5}$ then $\sin 2\alpha$ =

a) $\frac{16}{15}$ b) $\frac{56}{65}$ c) 0 d) $\frac{64}{65}$

16) $\left(\frac{\cos x}{\operatorname{cosec} x}\right) - \sqrt{1-\sin^2 x}\sqrt{1-\cos^2 x}$ is equal to

a) 0 b) cos2x - sin2x c) sin2x - cos2x d) 1

17) $f(x) = \begin{cases} x^2 - 4x & x \geq 2 \\ x+2 & x < 2 \end{cases}$ then f(0) is

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

18) If $f(x) = 2^x$ and $g(x) = \frac{1}{2^x}$ then (fg) (x) is

a) 1 b) 0 c) 4^x d) $\frac{1}{4^x}$

19) For what value of x, $f(x) = \frac{x+2}{x+1}$ is not continuous

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

20) $\frac{d}{dx}(5e^x - 2\log x) =$

a) $5e^x - 2x$ b) $5e^x - \frac{1}{x}$ c) $5e^x - \frac{2}{x}$ d) 2 logx

PART - II

Answer any 7 questions of the following. Q. No.30 is compulsory : 7×2=14

21) Prove that $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2 b^2 c^2$

22) The technology matrix of an economic systems of two industries is $\begin{pmatrix} 0.8 & 0.2 \\ 0.9 & 0.7 \end{pmatrix}$. Test whether the system is viable as per Hawkins - Simon Condition.

23) Find the value of A and B if $\frac{1}{x^2-1} = \frac{A}{x-1} + \frac{B}{x+1}$

24) Find the rank of the word "EXAM" in dictionary.

25) Find the acute angle between the lines $2x - y + 3 = 0$ and $x + y + 2 = 0$

26) Find the value of p if the line $3x + 4y - p = 0$ is the tangent to the circle $x^2 + y^2 = 16$.

27) Convert the following into the product of trigonometric functions $\cos 8A + \cos 12A$

28) Draw the graph of the function $f(x) = |x|$

29) Evaluate : $\lim_{x \to 0} \frac{\log(1 + x^3)}{\sin^3 x}$

30) In any quadrilateral ABCD, prove that $\sin(A+B) + \sin(C+D) = 0$

PART - III

Answer any 7 questions. Question No.40 is compulsory : **7×3=21**

31) If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 0 & -1 \\ 1 & 2 \end{pmatrix}$ then show that $(AB)^{-1} = B^{-1} A^{-1}$

32) Solve by Matrix inversion method: $2x - z = 0$, $5x + y = 4$, $y + 3z = 5$

33) Find the middle term in the expansion of $\left(x^2 - \frac{2}{x}\right)^{10}$

34) If $(n+2)C_n = 45$ the find the value of n.

35) The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is twice that of the other show that $8h^2 = 9ab$.

36) If the lines $x + y = 6$ and $x + 2y = 4$ are diameters of the circle and the circle passes through the point (2, 6) then find the equation.

37) Prove that $(\cos\alpha + \cos\beta)^2 + (\sin\alpha + \sin\beta)^2 = 4\cos^2\left(\frac{\alpha - \beta}{2}\right)$

38) If $\tan A - \tan B = X$ and $\cot B - \cot A = Y$ prove that $\cot(A - B) = \frac{1}{X} + \frac{1}{Y}$

39) If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, $0 < x < 1$ show that $f\left(\frac{2x}{1+x^2}\right) = 2f(x)$

40) $f(x) = \begin{cases} 6ax + 3b, & x > 1 \\ ax - 2b, & x < 1 \\ 15, & x = 1 \end{cases}$ is continuous at $x = 1$ find the value of a and b.

PART - IV

Answer all the questions: **7×5=35**

41) Show that the matrices $A = \begin{pmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} \frac{-4}{35} & \frac{11}{35} & \frac{-5}{35} \\ \frac{-1}{35} & \frac{-6}{35} & \frac{25}{35} \\ \frac{6}{35} & \frac{1}{35} & \frac{-10}{35} \end{pmatrix}$ are inverse of each other.

(OR)

Two commodities A and B are produced such that 0.4 tonne of A and 0.7 tonne of B are requried to produce a tonne of A. Similarly 0.1 tonne of A and 0.7 tonne of B are need to produce a tonne of B. Write down the technology matrix is 6.8 tonnes of A and 10.2 tonnes of B are required. Find the gross production of both of them.

42) Show by the principle of mathermatical induction that $2^{3n} - 1$ is divisible by 7, for all $n \in N$.

(OR)

In how many ways can a cricket team of 11 players be chosen out of a batch of 15 players?

i) There is no restriction on the selection ii) A particular player is always chosen iii) A particular player is never chosen.

43) A manufacturer produces 80 TV sets at a cost of Rs.2,20,000 and 125 TV sets at a cost of Rs. 2,87,500. Assuming the cost curve to be linear find the linear expression of the given information. Also estimate the cost of 100 TV sets.

(OR)

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

44) Prove that $\tan^{-1}\left(\frac{m}{n}\right) - \tan^{-1}\left(\frac{m-n}{m+n}\right) = \frac{\pi}{4}$ **(OR)**

Prove that $\cos 4x = 1 - 8 \sin^2 x \cos^2 x$

45) Differentiate : $\sqrt{\frac{(x-3)(x^3+4)}{(5x^2+6x+3)(x-2)}}$ **(OR)**

If $y = (x + \sqrt{1+x^2})^m$ then show that $(1+x^2)y_2 + xy_1 - m^2 y = 0$

46) Find $\frac{d}{dx}(e^{3x})$ from first principle. **(OR)**

Prove that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$

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

Resolve into partial fractions : $\frac{3x+5}{(x-1)(x^2+1)}$

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