BUDHA DAL PUBLIC SCHOOL, PATIALA

FINAL EXAMINATION (16 March 2024)

Class : XI

Subject : Mathematics (041)

(Set-A)

Time:3hrs. **MM: 80**

General Instructions :

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory.
2. Section A has 20 MCQ's questions of 1 mark each.
3. Section B has 5 questions of 2 marks each.
4. Section C has 6 questions of 3 marks each.
5. Section D has 4 questions of 5 marks each.
6. Section E has 3 case based questions of 4 marks each.

Section – A

Q1. Let A and B be two sets in the same universal set. Then A -- B =

a) $A \cap B$ b) $A' \cap B$ c) $A \cap B'$ d) none of these

Q2. If $A = \{1, 3, 5, B\} and\ B = \{2, 4\}$, then

a) $4 \in A$ b) $\{4\} \subset A$ c) $B \subset A$ d) none of these

Q3. Let R be a relation on N defined by $x + 2y = 8$. The domain of R is

a) $\{2, 4, 8\}$ b) $\{2, 4, 6, 8\}$ c) $\{2, 4, 6\}$ d) $\{1, 2, 3, 4\}$

Q4. The domain of the function $f(x) = \frac{x^2+1}{x^2-3x+2}$

a) $R - \{1, 2\}$ b) $R - \{-1. -2\}$ c) $\{-1, 2\}$ d) $\{+1, -2\}$

Q5. The degree measure of $\frac{9\pi}{5}$ radian is

a) 234^0 b) 324^0 c) 334^0 d) 312^0

Q6. The value of $\sqrt{-25} \times \sqrt{-9}$ is

a) 15 b) $15i$ c) -15 d) none of these

Q7. If $-3x + 17 < -13$, then

a) $x \in (10, \infty)$ b) $x \in [10, \infty)$ c) $x \in (-\infty, 10)$ d) $x \in (-10, 10)$

Q8. The number of possible outcomes, when coin is tossed 6 times, is

a) 36 b) 64 c) 12 d) 32

Q9. The number of ways to arrange the letters of the word CHEESE are

a) 120 b) 240 c) 720 d) 6

Q10. The number of terms in the expansion of $\{(2x + y^3)^4\}^7$

a) 28 b) 29 c) 84 d) none of these

Q11. Geometric mean of 64 and 4 is

a) 8 b) 16 c) 24 d) 32

Q12. The common ratio in $a, \frac{3a^2}{4}, \frac{9a^3}{16} \ldots\ldots$ is

a) $\frac{4}{3}$ b) $\frac{3}{4}$ c) $\frac{3}{4}a$ d) $\frac{4a}{3}$

Q13. $\tan\left(\frac{3\pi}{2} - x\right) =$

b) $\tan x$ b) $\cot x$ c) $-\cot x$ d) $cosec\, x$

Q14. Distance between the lines $5x + 3y - 7 = 0$ *and* $15x + 9y + 14 = 0$ is

a) $\frac{35}{\sqrt{34}}$ b) $\frac{1}{3\sqrt{34}}$ c) $\frac{35}{3\sqrt{34}}$ d) $\frac{35}{2\sqrt{34}}$

Q15. The equation of directrix of parabola $x^2 = 6y$ is

a) $y = -\frac{3}{2}$ b) $x = -\frac{3}{2}$ c) $x = 6$ d) $y = 6$

Q16. Name of the octant of point $(-5, 4, 3)$ is

a) $OX'Y'Z$ b) $OX'YZ'$ c) $OX'YZ$ d) $OXYZ$

Q17. $\lim_{x\to 0} \frac{\sin 5x}{2x}$ equals to

a) $\frac{2}{5}$ b) 5 c) $\frac{5}{2}$ d) none of these

Q18. $\lim_{x\to 1} \frac{\sqrt{x+8}}{\sqrt{x}}$ equals to

a) 9 b) 3 c) 1 d) 0

In the following questions a statements – Assertion (A) and Reason (R). Answer the question selecting appropriate option given below:

a) Both A and R are true and R is correct explanation for A.
b) Both A and R are true but R is not correct explanation for A.
c) A is true but R is false.
d) A is false but R is true.

Q19. Assertion (A) : Derivative of $x \sin x$ is $x \cos x + \sin x$

Reason (R) : $\frac{d}{dx}\{f(x).g(x)\} = f(x)\frac{d}{dx}g(x) + g(x).\frac{d}{dx}f(x)$

Q20. Assertion (A): The probability of a sure event is 1

Reason (R) = Let E be an event. Then , $0 \le P(E) \le 1$

Section – B

Q21. In a group of 400 people, 250 can speak Hindi and 200 can speak English. How many people can speak both Hindi and English?

Q22. If $sec\, x = \frac{13}{5}, x \in IVth$ quadrant, then find $\cos x + \tan x$

Q23. Find the equation of line passing through the points A(1, 1) B (3, −4)

Q24. Show that points $A(-2,3,5), B\ (1,2,3) and\ C\ (7,0,-1)$ are collinear, using distance formula

Q25. Given $P(A) = \frac{3}{5}, P(B) = \frac{1}{5}$. Find P (A or B), if A and B are mutually exclusive

Section – C

Q26. Find domain and range of $f(x) = \sqrt{9 - x^2}$

Q27. If $(x + iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4\ (x^2 - y^2)$

Q28. Solve the inequalities and represent solution graphical

i) $7 \leq \left(\frac{3x+11}{2}\right) \leq 11$ ii) $3x - 7 > 2\ (x - 6),\ 6 - x > 11 - 2x$

Q29. Find the sum to n terms of the sequence : 8, 88, 888, 8888, ... n terms

Q30. Find the centre and radius of the circle: $x^2 + y^2 - 4x - 8y - 45 = 0$

Q31. Three coins are tossed once. Find the probability of getting.

a) atmost 2 heads b) no head c) 3 tails

Section – D

Q32. i) Find $(a + b)^4 - (a - b)^4$. Hence evaluate $\left(\sqrt{3} + \sqrt{2}\right)^4 - \left(\sqrt{3} - \sqrt{2}\right)^4$

ii) Expand $\left(x + \frac{1}{x}\right)^5$

Q33. Reduce the following equation $4x - 3y - 12 = 0$

i) into intercept form and find their intercept on the axes.

ii) Find the equation of line parallel to $3x - 4y + 2 = 0$ and passing through the point $(-2,3)$

Q34. Find the co-ordinates of foci, the vertices, the length of major axis, the minor axis, the eccentricity of the ellipse $36x^2 + 4y^2 = 144$

Q35. Calculate mean, variance and S.D of the following distribution by short cut method

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

Section – E

Case Study based questions:

Q36. To demonstrate the compound angle formulas in Trigonometry. Geeta and Meeta selected two angles A and B such that $A, B \in \left(0, \frac{\pi}{2}\right)$ and $\sin A = \frac{3}{5}, \cos B = \frac{9}{41}$

Answer the following questions based on above information :

1. Evaluate: $\sin A \cos B + \cos A \sin B$ (1)
2. Evaluate: $\sin 2A$ (1)
3. Evaluate: $\tan(A + B)$ (2)

Q37. Four friends decide to play a game of cards. They picked a normal deck of 52 playing cards. The deck has 4 suits (Hearts, Diamonds, Spade and Club). Hearts and diamonds are red in colour, while spades and clubs are black in colour. Each suit has 13 cards each with one Ace (A), 9 numbered cards (2 to 10) and 3 face cards (Jack (J), King (K), Queen (Q).

Answer the following questions based on above information :

a) In how many different ways can four cards be drawn from the deck? (1)
b) In how many of these four cards are of the same suit? (1)
c) In how many of these two are red cards and two are black cards? (2)

38. Suppose f in real valued function, the derivative of $f(x)$ is denoted by $f'(x)$ by first principle method given by $f'(x) = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$

Also, if we have u and v as two functions in variable x and $u' = \frac{du}{dx}, v' = \frac{dv}{dx}$, then derivative of their product and quotient is as below :

If $y = uv$, then $y' = uv' + vu'$ and if $y = \frac{u}{v}$, then $y' = \frac{vu'-uv'}{v^2}$

i) Find the derivative of $f(x) = 10x$, using first principle method. (1)
ii) Find the derivative, using product rule $y = x^{-3}(5 + 3x)$ (1)
iii) Find the derivative, using quotient rule $y = \frac{x+1}{x-1}$ (2)

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4. Section C has 6 questions of 3 marks each.
5. Section D has 4 questions of 5 marks each.
6. Section E has 3 case based questions of 4 marks each.

Section – A

Q1. The number of subsets of a set containing n elements is

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

Q2. For any two sets A and B, $A \cap (A \cup B) =$

a) A b) B c) $\emptyset$ d) none of these

Q3. Let R be a relation on N defined by $x + 2y = 8$. The domain of R is

a) $\{2, 4, 8\}$ b) $\{2, 4, 6, 8\}$ c) $\{2, 4, 6\}$ d) $\{1, 2, 3, 4\}$

Q4. The domain of the function $f(x) = \frac{x^2+2x+1}{x^2-x-6}$

a) $R - \{-2,3\}$ b) $R - \{-3, 2\}$ c) $R - \{+2, 3\}$ d) $\{-2, 3\}$

Q5. The degree measure of $\frac{18\pi}{5}$ radians is

a) 486^0 b) 684^0 c) 648^0 d) 668^0

Q6. The value of $\sqrt{-2} \times \sqrt{-3}$ is

a) $\sqrt{6}$ b) $-\sqrt{6}$ c) $i\sqrt{6}$ d) none of these

Q7. If $5x - 3 < 3x + 1$, then

a) $x \in (2, \infty)$ b) $x \in (-\infty, 2)$ c) $x \in (2, 2)$ d) $x \in (0, 2)$

Q8. The number of possible outcomes, when a die tossed 3 times, is

a) 36 b) 616 c) 216 d) 18

Q9. The number of ways to arrange the letters of the word GEESE are

a) 120 b) 20 c) 40 d) 240

Q10. The number of terms in the expansion of $\{(5x + y^3)^7\}^5$

a) 35 b) 36 c) 105 d) none of these

Q11. Geometric mean of 25 and 36 is

a) 30 b) 60 c) 625 d) none of these

Q12. The common ratio in $a, \frac{3a^2}{4}, \frac{9a^3}{16} \ldots\ldots$ is

a) $\frac{4}{3}$ b) $\frac{3}{4}$ c) $\frac{3}{4}a$ d) $\frac{4a}{3}$

Q13. $\tan\left(\frac{3\pi}{2}+x\right) =$

b) $\cot x$ b) $-\cot x$ c) $+\tan x$ d) $sec\ x$

Q14. The distance between the lines $3x-4y+9=0$ *and* $6x-8y-15=0$ is

a) $\frac{23}{10}$ b) $\frac{33}{10}$ c) 33 d) 23

Q15. The equation of directrix of parabola $y^2 = 8x$ is

a) $x = 8$ b) $x = 2$ c) $x = -2$ d) $y = 8$

Q16. Name of the octant of point $(4, -3, 5)$ is

a) $OXYZ$ b) $OX'Y'Z$ c) $OXY'Z$ d) $OXYZ'$

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a) $\frac{5}{3}$ b) $\frac{1}{5}$ c) $\frac{3}{5}$ d) none of these

Q18. $\lim_{x\to 3} \frac{\sqrt{2x+3}}{x+3}$ equals to

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

In the following questions a statements - Assertion (A) and Reason (R). Answer the question selecting appropriate option given below:

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Q20. Assertion (A): The probability of a sure event is 1

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Section – B

Q21. In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak atleast one of those two languages?

Q22. If $cot\ x = \frac{3}{4}, x \in IIIrd$ quadrant, then find $\tan x + \sin x$.

Q23. Find the equation of line passing through the points A$(-1, 1)$ B $(2, -4)$

Q24. Show that points $P(-2, 3, 5), Q\ (1, 2, 3)\ and\ R\ (7, 0, -1)$ are collinear, using distance formula.

Q25. Given two mutually exclusive events A and B such that $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}$.
Find P (A or B).

Section – C

Q26. Find domain and range of $f(x) = \sqrt{16 - x^2}$

Q27. If $x + iy = \sqrt{\frac{a-ib}{c-id}}$, prove that $(x^2 + y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$

Q28. Solve the inequalities and represent solution graphical on number line

i) $6 \leq -3\ (2x - 4) < 12$ ii) $5\ (2x - 7) - 3\ (2x + 3) \leq 0, 2x + 19 \leq 6x + 47$

Q29. Find the sum to n terms of the sequence : 5, 55, 555, 5555, ... n terms

Q30. Find the centre and radius of the circle: $x^2 + y^2 - 8x + 10y - 12 = 0$

Q31. The coins are tossed once. Find the probability of getting.

a) 3 heads b) 2 heads c) atleast 2 heads

Section – D

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