VERY IMPORTANT QUESTIONS

MATH 2A

VSAQs

Ch.1: Complex Numbers

1) If $Z_1 = (2,-1)$, $Z_2 = (6,3)$ & find $Z_1 - Z_2$

2) If $Z = (\cos\theta, \sin\theta)$ find $(Z - \frac{1}{Z})$

3) write the multiplicative inverse of $(7,24)$

4) write the following complex numbers in the form $A+iB$ $\quad \frac{2+5i}{3-2i} + \frac{2-5i}{3+2i}$

5) write the conjugate of the following complex numbers. (i) $(2+5i)(-4+6i)$ (ii) $\frac{5i}{7+i}$

6) Simplify $i^2 + i^4 + i^6 + \ldots\ldots + (2n+1)$ terms.

7) If $(a+ib)^2 = x+iy$ find x^2+y^2

8) If $Z_1 = -1$ & $Z_2 = -i$ then find $\text{Arg}(Z_1 \cdot Z_2)$

9) If $Z_1 = -1$ & $Z_2 = i$ then find $\text{Arg}\left(\frac{Z_1}{Z_2}\right)$.

10) If the $\text{Arg}Z_1$ and $\text{Arg}Z_2$ are $\frac{\pi}{5}$ and $\frac{\pi}{3}$ resptectively then find $(\text{Arg}Z_1 + \text{Arg}Z_2)$

Ch2: Demoivre's Theorem

11) Simplify $\frac{(\cos\alpha + i\sin\alpha)^4}{(\sin\beta + i\cos\beta)^8}$

12) find the values of $\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^5 - \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^5$

13) If $x = \text{cis}\theta$, then find the value of $\left(x^6 + \frac{1}{x^6}\right)$

14) find the cube roots of 8.

15) If $1, \omega, \omega^2$ are the cube roots of unity then prove that (i) $\frac{1}{2+\omega} + \frac{1}{1+2\omega} = \frac{1}{1+\omega}$

16) $(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11}) = 49$

17) If ABC are angles of a triangle such that $X = \text{cis}A$, $Y = \text{cis}B$, $Z = \text{cis}C$, then find the value of XYZ

18) Find $(1-\omega+\omega^2)^3$.

Ch-3 : Quadratic Expressions

19) Find the roots of the equations $x^2-7x+12=0$.

20) Find the nature of the roots of $4x^2-20x+25=0$.

21) Form Quadratic equations whose roots are $7\pm2\sqrt{5}$

22) If α, β are the roots of the equation $ax^2+bx+c=0$ find the values of the following expressions in terms of a, b, c.

(i) $\frac{1}{\alpha}+\frac{1}{\beta}$ (ii) $\alpha^4\beta^7+\alpha^7\beta^4$ (iii) $\left(\frac{\alpha}{\beta}-\frac{\beta}{\alpha}\right)^2$

(iv) $\left(\frac{1}{\alpha^2}+\frac{1}{\beta^2}\right)$ (v) $\left(\frac{\alpha}{\beta^2}+\frac{\beta}{\alpha^2}\right)$, if $c\neq0$.

23) Find the values of 'm' for which the following equations have equal roots.

$x^2-15-m(2x-8)=0$.

24) For what values of 'x' the expression, $x^2-5x-14$ is positive.

25) If $x^2-6x+5=0$ & $x^2-3ax+35=0$ have a common root, then find 'a'.

Ch. 4 : Theory of Equations

26) If α, β, γ are the roots of $4x^3-6x^2+7x+3=0$ then find the value of $\alpha\beta+\beta\gamma+\gamma\alpha$

27) If $1, 1, \alpha$ are the roots of $x^3 - 6x^2 + 9x - 4 = 0$ then find α.

28) If $-1, 2$ and α are the roots of $2x^3 + x^2 - 7x - 6 = 0$ then find α.

29) If $1, -2, 3$ are the the roots of $x^3 - ax^2 + ax + 6 = 0$ then find 'a'.

30) If the product of the roots of $4x^3 + 16x^2 - 9x - a = 0$ is 9, then find 'a'.

31) Find the Transformed equation whose roots are the negatives of the roots of $x^4 + 5x^3 + 11x + 3 = 0$

Ch:5 : Permutations and Combinations

32) If $^nP_3 = 1320$ find 'n'

33) If $^nP_7 = 42 \cdot {}^nP_5$, find 'n'

34) If $^{12}P_5 + 5 \cdot {}^{12}P_4 = {}^{13}P_r$ find 'r'.

35) If $^{(n+1)}P_5 : {}^nP_5 = 3:2$, find 'n'.

36) $^{56}P_{(r+6)} : {}^{54}P_{(r+3)} = 30800 : 1$ find 'r'

37) Find the number of ways of Preparing a chain with 6 different coloured beads.

38) Find the number of ways of arranging the letters of the word INDEPENDENCE.

39) Find for MATHEMATICS.

40) Find for INTERMEDIATE

41) Find the number of diagonals of a Polygon with 12 sides.

42) Find the number of positive divisors of 10...

43) If $^{12}C_{r+1} = {}^{12}C_{3r-5}$ find 'r'.

44) If $^{n}C_5 = {}^{n}C_6$ then find $^{13}C_n$.

Ch:6: BINOMIAL THEOREM

45) Find the middle term(s) of the following expansion $(3x-5b)^6$.

46) Find the sum of last 20 co-efficients in the expansion of $(1+x)^{39}$.

47) Find the number of terms in the expansion of (i) $\left[\frac{3a}{4} + \frac{b}{2}\right]^9$ (ii) $(2x+3y+z)^7$.

48) write down & Simplify 7th term in $(3x-4y)^{10}$.

49) Find the Set 'E' of the values of 'x' for which the binomial expansion for the following is valid $(3-4x)^{\frac{3}{4}}$

Ch:08: MEASURES OF DISPERSION

50) Find the mean deviation from the mean of the following discrete data:
6, 7, 10, 12, 13, 4, 12, 16.

51) Same as above 3, 6, 10, 4, 9, 10.

52) Find the mean deviation about the median for the following data 4, 6, 9, 3, 10, 13, 2

53) Find the variance of the discrete data given below
6, 7, 10, 12, 13, 4, 8, 12

42) Find the number of positive divisors of 1080.

43) If $^{12}C_{r+1} = {}^{12}C_{3r-5}$ find 'r'.

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Ch:10: RANDOM VARIABLES AND PROBABILITY DISTRIBUTION

54) 8 coins are tossed simultaneously. Find the probability of getting atleast 6 heads.

55) The mean and variance of a binomial distribution are 4 and 3 respectively. Fix the distribution and find $P(X \geq 1)$

56) The probability that a person chosen at random is left handed (in hand writing) is 0.1. What is the probability that in a grp of 10 people there is one who is left handed.

57) If the difference between the mean & variance of a binomial variate is $\frac{5}{9}$ then, find the probability for the even of 2 Successes when the experiment is conducted 5 times.

SAQs

ch:01 : COMPLEX NUMBERS

1) If $x+iy = \frac{1}{1+\cos\theta+i\sin\theta}$, then S.T $4x^2-1=0$

2) If $x+iy = \frac{3}{2+\cos\theta+i\sin\theta}$, then S.T $x^2+y^2 = 4x-3$.

3) If $z = 3-5i$, then S.T $z^3 - 10z^2+58z-136=0$

4) S.T $\frac{2-i}{(1-2i)^2}$ and $\frac{-2-11i}{25}$ are conjugates to each other.

5) Show that the four points in the Argand plane represented by the complex numbers $2+i$, $4+3i$, $2+5i$, $3i$ are the vertices of a square.

6) S T the pts in the Argand plane $4i$, $-\frac{3}{2}+\frac{1}{2}i$, $4-3i$, $\frac{7}{2}(1+i)$ are the vertices of a rhombus.

Chapter : 03 : Quadratic Expression:

7) If α, β are the roots of the quadratic equation $ax^2+bx+c=0$, find the value of $\alpha^2+\beta^2$ in terms of a, b, c.

8) Determine the Range of $\frac{x^2+x+1}{x^2-x+1}$

9) $\frac{x+2}{2x^2+3x+6}$

10) Prove that $\frac{1}{3x+1} + \frac{1}{x+1} - \frac{1}{(3x+1)(x+1)}$ does not lie between 1 & 4, if x is real.

11) If 'x' is real P T $\frac{x}{x^2-5x+9}$ lies b/w $\frac{-1}{11}$ & 1

12) Find bounds of $\frac{x-p}{x^2-3x+2}$ for all $x \in R$

Ch:5: Permutations & Combinations

13) Find the rank of "PRISON" if permuted in all possible ways.

14) Find the rank of (i) MASTER (ii) REMAST

15) Find the sum of all 4-digit no's that can be formed using 1, 3, 5, 7, 9

16) Find the Sum of digits 0, 2, 4, 7, 8 without repitition.

17) Find the rank of word EAMCET

18) Find the number of ways of selecting a cricket team of 11 players from 7 batsmen & 6 bowlers such that there will be atleast 5 bowlers in the team.

19) Find ways forming a committee of 5 members out of 6 Indians and 5 Americans so that always Indians will be in majority in committee.

20) P.T $^{25}C_4 + \sum_{r=0}^{4} {}^{(29-r)}C_3 = {}^{30}C_4$

21) P.T $\frac{^{4n}C_{2n}}{^{2n}C_n} = \frac{1 \cdot 3 \cdot 5 \cdots (4n-1)}{\{1 \cdot 3 \cdot 5 \cdots (2n-1)\}^2}$

22) Simplify $^{34}C_5 + \sum_{r=0}^{4} {}^{(38-r)}C_4$.

Ch:07: PARTIAL FRACTIONS

23) Resolve $\frac{5x+1}{(x+2)(x-1)}$ into Partial fractions.

24) Resolve $\frac{3x+7}{x^2-3x+2}$

25) Resolve $\frac{x^2-x+1}{(x+1)(x-1)^2}$

26) Resolve $\frac{2x^2+3x+4}{(x-1)(x^2+2)}$

27) Resolve $\frac{x^3}{(x-a)(x-b)(x-c)}$

28) Resolve $\frac{x4}{(x-1)(x-2)}$

Ch:09: PROBABILITY

29) A and B are events with $P(A)=0.5$, $P(B)=0.4$ and $P(A \cap B)=0.3$. Find the probability that
(i) A does not occur (ii) neither A nor B occurs.

30) A, B, C are three horses in a race. The Probability of A to win the race is twice that of B and probability of B is twice that of C. what are the probabilities of A, B and C to win the race?

31) In a committee of 25 members, each member is Proficient either in mathematics or in Statistics or both. If 19 of these are proficient in maths, 16 in statistics, find the probability that a person selected from the committee is proficient in both.

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25) Resolve $\frac{x^2-x+1}{(x+1)(x-1)^2}$

26) Resolve $\frac{2x^2+3x+4}{(x-1)(x^2+2)}$

27) Resolve $\frac{x^3}{(x-a)(x-b)(x-c)}$

28) Resolve $\frac{x^4}{(x-1)(x-2)}$

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32) Suppose A and B are independent events with $P(A) = 0.6$, $P(B) = 0.7$ then compute
(i) $P(A \cap B)$ (ii) $P(A \cup B)$ (iii) $P(B/A)$ (iv) $P(A^c \cap B^c)$

33) Let A and B be independent events with $P(A) = 0.2$, $P(B) = 0.5$ Let us find
(i) $P(A/B)$ (ii) $P(B/A)$ (iii) $P(A \cap B)$ & (iv) $P(A \cup B)$

34) A speaks truth in 75% of the cases and B in 80% cases. What is the probability that their statements about an incident do not match.

35) A problem in calculus is given to two students A and B whose chances of solving it are $\frac{1}{3}$ & $\frac{1}{4}$ respectively. Find the probability of the problem being solved both of them try independently.

36) If A, B are two events with $P(A \cup B) = 0.65$, $P(A \cap B) = 0.15$, then find $P(A^c) + P(B^c)$.

LAQS

Ch:02 ; DEMOIVRE'S THEOREM

01) If 'n' is a positive integer, then show that
$(1+i)^n + (1-i)^n = 2^{\frac{n+2}{2}} \cos\left(\frac{n\pi}{4}\right)$

02) S.T $(1+i)^{2n} + (1-i)^{2n} = 2^{n+1} \cos\frac{n\pi}{2}$

3) S.T $(1+\cos\theta + i\sin\theta)^n + (1+\cos\theta - i\sin\theta)^n = 2^{n+1} \cos^n\left(\frac{\theta}{2}\right) \cos\frac{n\theta}{2}$.

4) If $\cos\alpha + \cos\beta + \cos\gamma = 0 = \sin\alpha + \sin\beta + \sin\gamma$, Prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = \frac{3}{2} = \sin^2\alpha + \sin^2\beta + \sin^2\gamma$.

5) If $n \in$ integers. & $z = cis\theta$ $(\theta \neq (2n+1)\frac{\pi}{2})$, then S.T $\frac{z^{2n}-1}{z^{2n}+1} = i\tan n\theta$.

6) S.T the one value of $\left[\frac{1+\sin\frac{\pi}{8} + i\sin\cos\frac{\pi}{8}}{1+\sin\frac{\pi}{8} - i\cos\frac{\pi}{8}}\right]^{8/3}$ is -1

Chapter 04: THEORY OF EQUATIONS

7) Solve $18x^3+81x^2+121x+60=0$ given that one the roots is equal to half the sum of the remaining roots.

8) Solve $x^4+x^3-16x^2-4x+48=0$, given that the product of two roots is 6.

9) Solve $x^3-7x^2+14x-8=0$, given the roots are in G.P

10) Solve $3x^3-26x^2+52x-24=0$, roots are in G.P.

11) Find the polynomial eqn whose roots are the translates of those of the eqn $x^4-5x^3+7x^2-17x+11=0$ by -2.

12) $x^5-4x^4+3x^2-4x+6=0$ by -3.

13) $x^4-10x^3+26x^2-10x+1=0$.

Ch.06: BINOMIAL THEOREM

14) For $r=0,1,2,\ldots n$ P.T $C_0C_r+C_1C_{r+1}+C_2C_{r+2}+\ldots+C_{n-r}C_n = {}^{2n}C_{n+r}$ and hence deduce that

$C_0^2+C_1^2+C_2^2+\ldots+C_n^2 = {}^{2n}C_n$.

15) P.T $C_0+C_1\frac{x}{2}+C_2\frac{x^2}{3}+C_3\frac{x^3}{4}+\ldots+C_n\frac{x^n}{n+1} = \frac{(1+x)^{n+1}-1}{(n+1)x}$.

16) If the coeffts of x^9, x^{10}, x^{11} in the expansion of $(1+x)^n$ are in A.P then P.T $n^2-41n+398=0$

17) If the coeffts of r^{th}, $(r+1)^{th}$ & $(r+2)^{th}$ term in the expansion of $(1+x)^n$ are in A.P then S.T $n^2-(4r+1)n+4r^2-2=0$.

18) If 2nd, 3rd the co-effts of 4 consecutive terms in the expansion of $(1+x)^n$ are a_1, a_2, a_3, a_4 respectively then S.T $\frac{a_1}{a_1+a_2}+\frac{a_3}{a_3+a_4} = \frac{2a_2}{a_2+a_3}$.

19) Find the sum of infinite series

$$1+\frac{1}{3}+\frac{1\cdot3}{3\cdot6}+\frac{1\cdot3\cdot5}{3\cdot6\cdot9}+\cdots$$

20) If $x=\frac{1}{5}+\frac{1\cdot3}{5\cdot10}+\frac{1\cdot3\cdot5}{5\cdot10\cdot15}+\cdots\infty$ then

21) If $x=\frac{1\cdot3}{3\cdot6}+\frac{1\cdot3\cdot5}{3\cdot6\cdot9}+\frac{1\cdot3\cdot5\cdot7}{3\cdot6\cdot9\cdot12}+\cdots$ then P.T

$$9x^2+24x=11$$

Ch:08: MEASURES of DISPERSION

22) Find the mean deviation about the mean for the following data:

x_i	2	5	7	8	10	35
f_i	6	8	10	6	8	2

23) Find M D of the data given below.

Sales (in Rs)	40-50	50-60	60-70	70-80	80-90	90-100
No. of companies	5	15	25	30	20	5

24) Find the M.D from the mean of the following data using step deviation method.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	6	5	8	15	7	6	3

25) Find the Variance & Standard deviation of the following frequency distribution.

x_i	4	8	11	17	20	24	32
f_i	3	5	9	5	4	3	1

Ch.09: PROBABILITY

26) State & prove the addition theorem on Probability.

27) Find the probability of drawing an ace or a spade from a well shuffled pack of 52 playing cards.

28) A, B, C are three events such that $P(A \cap B^c \cap C^c) = \frac{1}{4}$, $P(A^c \cap B \cap C^c) = \frac{1}{8}$, $P(A^c \cap B^c \cap C) = \frac{1}{4}$ then find $P(A)$, $P(B)$ & $P(C)$

29) Three boxes numbered I, II, III contain the balls as follow

	White	Black	Red
I	1	2	3
II	2	1	1
III	4	5	3

One box is randomly selected and a ball is drawn from it. If ball is red, then find the Probability that it from box II.

30) State and Prove Baye's theorem.

Ch.10: RANDOM VARIABLES AND PROBABILITY DISTRIBUTION

31) The probability distribution of a random variable 'X' is given below

$X = x_i$	1	2	3	4	5
$P(X = x_i)$	K	2K	3K	4K	5K

Find the value of 'K', the mean & Variance of X.

32) Find K & Variance.

$X=x$	-2	-1	0	1	2	3
$P(X=x)$	0.1	K	0.2	$2K$	0.3	K

33) Find Variance of X.

$X=x$	-3	-2	-1	0	1	2	3
$P(X=x)$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{3}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$

34) Find (i) K (ii) mean & (iii) $P(0<X<5)$ for the following.

$(X=x)$	0	1	2	3	4	5	6	7
$P(X=x)$	0	K	$2K$	$2K$	$3K$	K^2	$2K^2$	$7K^2+K$

35) The range of a random variable X is $\{0,1,2\}$ Given that $P(X=0)=3c^3$, $P(X=1)=4c-1$, $P(X=2)=5c-1$ (i) find 'c' (ii) $P(X<1)$, $P(1<X\leq 3)$ and $P(0<X\leq 3)$

36) If the mean and variance of a binomial variable X are 2.4 and 1.44 respectively, find $P(1<X\leq 4)$.