Quarterly Examination, September - 2013

Standard 11
MATHEMATICS

Time: 3.00 Hrs. Marks: 200

Section - A

Note: i) All questions are compulsory. ii) Each question carries 1 mark.
iii) Choose the most suitable answer from the given four alternatives. **40×1=40**

1) The product of the matrices $\begin{bmatrix}7 & 5 & 3\end{bmatrix}\begin{bmatrix}7\\3\\2\end{bmatrix}$ is equal to

a) [70] b) [49] c) [15] d) 70

2) If $\begin{bmatrix}2 & x & -1\end{bmatrix}\begin{bmatrix}0\\x\\3\end{bmatrix} = [13]$ then the value of x is

a) 5 b) 2 c) ±3 d) ±4

3) Matrix A is of order 2×3 and B is of order 3×2 then the order of AB

a) 3×3 b) 2×3 c) 2×2 d) 3×2

4) The minor of 2 in $\begin{vmatrix}2 & -3\\6 & 0\end{vmatrix}$ is

a) 0 b) 1 c) 2 d) −3

5) The solution of $\begin{vmatrix}2x & 3\\2 & 3\end{vmatrix} = 0$ is

a) x = 1 b) x = 2 c) x = 3 d) x = 0

6) If $A = \begin{bmatrix}a_1 & b_1 & c_1\\a_2 & b_2 & c_2\\a_3 & b_3 & c_3\end{bmatrix}$ and |A| = 2 then |3A| is

a) 54 b) 67 c) 27 d) −54

7) The value of the determinant $\begin{vmatrix}a & 0 & 0\\0 & b & 0\\0 & 0 & c\end{vmatrix}^2$ is

a) abc b) 0 c) $a^2b^2c^2$ d) −abc

8) The value of the product $\begin{vmatrix}1 & 2\\-3 & 1\end{vmatrix}\times\begin{vmatrix}2 & 0\\1 & -4\end{vmatrix}$ is

a) 56 b) −56 c) −1 d) −63

9) The position vector of A is $2\vec{i}+3\vec{j}+4\vec{k}$, $\overrightarrow{AB} = 5\vec{i}+7\vec{j}+6\vec{k}$ then the position vector of B is

a) $7\vec{i}+10\vec{j}+10\vec{k}$ b) $7\vec{i}-10\vec{j}+10\vec{k}$ c) $7\vec{i}+10\vec{j}-10\vec{k}$ d) $-7\vec{i}+10\vec{j}-10\vec{k}$

10) Let $\vec{a}, \vec{b}$ be the vectors $\overrightarrow{AB}, \overrightarrow{BC}$ determined by two adjacent sides of regular hexagon ABCDEF. The vector represented by $\overrightarrow{EF}$ is

a) $\vec{a}-\vec{b}$ b) $\vec{a}+\vec{b}$ c) $2\vec{a}$ d) $-\vec{b}$

11) Which of the following vector has the same direction as the vector $\vec{i}-2\vec{j}$

a) $-\vec{i}+2\vec{j}$ b) $2\vec{i}+4\vec{j}$ c) $-3\vec{i}+6\vec{j}$ d) $3\vec{i}-6\vec{j}$

12) If G is the centroid of a triangle ABC then $\overrightarrow{GA}+\overrightarrow{GB}+\overrightarrow{GC}$ is equal to

a) $3(\vec{a}+\vec{b}+\vec{c})$ b) $\overrightarrow{OG}$ c) $\vec{0}$ d) $\frac{\vec{a}+\vec{b}+\vec{c}}{3}$

13) If $\vec{a} = 2\vec{i}+\vec{j}-8\vec{k}$ and $\vec{b} = \vec{i}+3\vec{j}-4\vec{k}$ then the magnitude of $\vec{a}+\vec{b}$ =

a) 13 b) 13/3 c) 3/13 d) 4/13

14) If the position vectors of P and Q are $2\vec{i}+3\vec{j}-7\vec{k}$, $4\vec{i}-3\vec{j}+4\vec{k}$, then the direction cosines of $\overrightarrow{PQ}$ are

a) $\frac{2}{\sqrt{161}},\frac{-6}{\sqrt{161}},\frac{11}{\sqrt{161}}$ b) $-\frac{2}{\sqrt{161}},\frac{-6}{\sqrt{161}},-\frac{11}{\sqrt{161}}$ c) (2, −6, 11) d) (1, 2, 3)

15) The position vectors of A and B are $\vec{a}$ and $\vec{b}$. P divides AB in the ratio 3:1 Q is the midpoint of AP. The position vector of Q is

a) $\frac{5\vec{a}+3\vec{b}}{8}$ b) $\frac{3\vec{a}+5\vec{b}}{2}$ c) $\frac{5\vec{a}+3\vec{b}}{4}$ d) $\frac{3\vec{a}+\vec{b}}{4}$

16) Sum of the squares of direction cosine is
a) 1 b) 0 c) 2 d) 3

17) If $\frac{ax}{(x+2)(2x-3)}=\frac{2}{x+2}+\frac{3}{2x-3}$ then a =
a) 4 b) 5 c) 7 d) 8

18) The number of diagonal that can be drawn by joining the vertices of an octag
a) 28 b) 48 c) 20 d) 24

19) If $nP_r = 720nC_r$, then the value of r is
a) 6 b) 5 c) 4 d) 7

20) A polygon has 44 diagonals then the number of its sides is
a) 11 b) 2 c) 8 d) 12

21) The values of $nC_0-nC_1+nC_2-nC_3+.....+(-1)^n.nC_n$ is
a) 2^{n+1} b) n c) 2^n d) 0

22) The largest coefficient in the expansion of $(1+x)^{24}$ is
a) $24C_{24}$ b) $24C_{13}$ c) $24C_{12}$ d) $24C_{11}$

23) Sum of the binomial coefficients is
a) 2n b) n^2 c) 2^n d) n+17

24) The last term in the expansion of $\left(2+\sqrt{3}\right)^8$ is

a) 81 b) 27 c) $\sqrt{3}$ d) 3

25) If a, b, c are in A.P. then 3^a, 3^b, 3^c are in
a) A.P. b) G.P. c) H.P. d) A.P. and G.P.

26) The sum of n terms of an A.P. is n^2. Then its common difference is
a) 2 b) −2 c) ±2 d) 1

27) The n^{th} term of the series 3+7+13+21+31+..... is
a) 4n−1 b) n^2+2n c) n^2+n+1 d) n^3+2

28) The first term of a G.P. is 1. The sum of third and fifth term is 90. Find the common ratio of the G.P.
a) ±2 b) $\sqrt{10}$ c) ±3 d) −3

29) If A,G,H are respectively arithmetic mean, geometric mean and harmonic mean then
a) A > G > H b) A < G < H c) A < G < H d) A > G < H

30) If a, b, c are in A.P. as well as in G.P. then
a) a = b ≠ c b) a ≠ b = c c) a ≠ b ≠ c d) a = b = c

31) When the terms of a G.P. are written in reverse order the progression formed is
a) A.P. b) G.P. c) H.P. d) A.P. and H.P.

32) The A.M., G.M. and H.M. between two positive numbers a and b are equal then
a) a = b b) ab = 1 c) a > b d) a < b

33) The slope of the straight line 2x−3y+1 = 0 is
a) $-\frac{2}{3}$ b) $-\frac{3}{2}$ c) $\frac{2}{3}$ d) $\frac{3}{2}$

34) Which of the following has the greatest y-intercept in magnitude?
a) 2x+3y = 4 b) x+2y = 3 c) 3x+4y = 5 d) 4x+5y = 6

35) The equation of the straight line is $y = \sqrt{3}x + 4$, then the angle made by the straight line with the positive direction of x-axis is
a) 45° b) 30° c) 60° d) 90°

36) If the straight lines $a_1x+b_1y+c_1 = 0$ and $a_2x+b_2y+c_2 = 0$ are perpendicular, then
a) $\frac{a_1}{a_2} = -\frac{b_1}{b_2}$ b) $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ c) $a_1a_2 = -b_1b_2$ d) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

37) The equation of the straight line containing the point (−2, 1) and parallel to the line $4x-2y = 3$ is
a) $y = 2x+5$ b) $y = 2x-1$ c) $y = x-2$ d) $y = \frac{1}{2}x$

38) If the slope of the straight line is $\frac{2}{3}$, then the slope of the line perpendicular to it is
a) $\frac{2}{3}$ b) $-\frac{2}{3}$ c) $\frac{3}{2}$ d) $-\frac{3}{2}$

39) If the pair of straight line given by $ax^2+2hxy+by^2 = 0$ are perpendicular then
a) $ab = 0$ b) $a+b = 0$ c) $a-b = 0$ d) $a = 0$

40) If $2x^2+Ky+4y^2 = 0$ represents a pair of parallel lines then K =
a) ±32 b) $\pm 2\sqrt{2}$ c) $\pm 4\sqrt{2}$ d) ±8

Section - B

Note: i) Answer any 10 questions ii) Each question carries 6 mark. **10×6=60**
iii) Question 55 is compulsory and choose any nine questions from the remaining.

41) If $A = \begin{matrix} 3 & -2 \\ 4 & -2 \end{matrix}$ find K so that $A^2 = KA-2I$.

42) If $A = \begin{matrix} 3 & -5 \\ -4 & 2 \end{matrix}$, show that $A^2-5A-14I = 0$

43) Prove that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

44) Prove that $\begin{vmatrix} 1 & a & a \\ a & 1 & a \\ a & a & 1 \end{vmatrix}^2 = \begin{vmatrix} 1-2a^2 & -a^2 & a^2 \\ -a^2 & -1 & a^2-2a \\ -a^2 & a^2-2a & -1 \end{vmatrix}$

45) If ABCD is a quadrilateral and E and F are the mid points of AC and BD respectively, prove that $\overrightarrow{AB}+\overrightarrow{AD}+\overrightarrow{CB}+\overrightarrow{CD} = 4\overrightarrow{EF}$

46) Show that the points whose position vectors $2\vec{i}+3\vec{j}-5\vec{k}$, $3\vec{i}+\vec{j}-2\vec{k}$ and $6\vec{i}-5\vec{j}+7\vec{k}$ are collinear.

47) Resolve into partial fractions $\frac{1}{(x-1)(x+1)}$

48) i) If $nP_4 = 20.nP_3$, find n.
ii) If $10P_r = 5040$, find the value of r.

49) Prove by mathematical induct' $1+2+3+.....+n = \frac{n(n+1)}{2}$, $n \in N$.

50) Insert four A.M.s between −1 and 14.

51) Find the value of $\sqrt[3]{126}$ correct to two decimal places.

52) Find the equation of the straight line passing through the point (1, 2) and making intercepts on the co-ordinates axes which are in the ratio 2:3.

53) If $ax+by+c = 0$, $bx+cy+a = 0$, $cx+ay+b = 0$ are concurrent, show that $a^3+b^3+c^3 = 3abc$.

54) Find the equations of the straight line which passes through the intersection of straight lines $5x-6y = 1$ and $3x+2y+5 = 0$ and is perpendiculr to the straight line $3x-5y+11 = 0$.

55) a] Find the coefficient of x^5 in the expansion of $\left(x+\frac{1}{x^3}\right)^{17}$

(OR)

b] The slope of one of the straight lines $ax^2+2hxy+by^2 = 0$ is thrice that of the other, show that $3h^2 = 4ab$.

Section - C

Note: i) Answer any 10 questions ii) Each question carries 10 mark. **10×10=100**
iii) Question 70 is compulsory and choose 9 question from remaining questions.

56) If $A = \begin{matrix}1 & 2\\ 2 & 0\end{matrix}$, $B = \begin{matrix}3 & -1\\ 1 & 0\end{matrix}$ verify that $(A-B)^2 \neq A^2-2AB+B^2$.

57) Prove that $\begin{vmatrix}1+a & 1 & 1\\ 1 & 1+b & 1\\ 1 & 1 & 1+c\end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ and hence evaluate the value of $\begin{vmatrix}1+a & 1 & 1\\ 1 & 1+a & 1\\ 1 & 1 & 1+a\end{vmatrix}$

58) Prove that $\begin{vmatrix}(b+c)^2 & a^2 & a^2\\ b^2 & (c+a)^2 & b^2\\ c^2 & c^2 & (a+b)^2\end{vmatrix} = 2abc\,(a+b+c)^2$

59) Prove that the medians of a triangles are concurrent.

60) Show that the vectors $\vec{i}-2\vec{j}+3\vec{k}$, $-2\vec{i}+3\vec{j}-4\vec{k}$ and $-\vec{j}+2\vec{k}$ are coplanar.

61) If $nP_r = nP_{(r+1)}$ and $nC_r = nC_{(r-1)}$, find the value of n and r.

62) Out of 18 points in a plane, no three are in the same straight line except five points which are collinear. How many (i) straight lines (ii) triangles can be formed by joining them?

63) Prove by Mathematical induction: $1.2+2.3+3.4+.....+n(n+1) = \frac{n(n+1)(n+2)}{3}, n \in N$.

64) Show that the middle term of $(1+x)^{2n}$ is $\frac{1.3.5.7.....(2n-1).2^n.x^n}{n!}$

65) If x is so small show that $\sqrt{\frac{1-x}{1+x}} = 1-x+\frac{x^2}{2}$ (app)

66) Show that the equation of the locus of a point which moves such that its distance from the points (1, 2) and (0, −1) are in the ratio 2:1 is $3x^2+3y^2+2x+12y-1 = 0$.

67) Show that the triangle formed by straight lines $4x-3y-18 = 0$, $3x-4y+16 = 0$ and $x+y-2 = 0$ is isosceles.

68) The equation of sides of a triangle are $x+2y = 0$, $4x+3y = 5$ and $3x+y = 0$. Find the co-ordinates of the orthocentre of the triangle.

69) For what value of K does $12x^2+7xy+Ky^2+13x-y+3 = 0$ represents a pair of straight lines. Also write the separate equations.

70) a] Resolve into partial fraction: $\frac{1}{(x-1)(x+2)^2}$

(OR)

b] If the 5^{th} and 12^{th} terms of a H.P. are 12 and 5 respectively, find the 15^{th} term.

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