JEE Main Session 2 Mathematics Exam: Model 1

1. $x^2/25 + y^2/16 = 1$ is the given ellipse. Find the length of the chord whose midpoint is $(1/2, 2/5)$.
2. Find p if:
   $3 + (3 + p)/4 + (3 + 2p)/4^2 + ...\infty = 8$
3. If a line $L = 4x + 5y = 20$ trisects two other lines L_1 and L_2 that pass through the origin, then find the tangent made by the line L.
4. If $a = i + 2j + k$, $b = 3 (i - j + k)$, $a \cdot c$ (scalar product) $= 3$ and $a \times c$ (vector product) $= b$, then find
   $a \cdot ((c \times b) - b - c)$.
5. The vertices of a triangle ABC are $A(1,2)$, $B(-3, 4)$ and $C(5,8)$, then the orthocentre of $\triangle ABC$ is?
6. $S_1 = 3,9,15, ... 25$ terms and $S_2 = 3,8,13, … 37$ terms, then the number of common terms in S_1, S_2 is equal to?
7. The value of k for $(2k, 3k)$, $(0, 0)$, $(1,0)$ and $(0,1)$ to be on the circle is:
8. If $^{n-1}C_r = (k^2 - 8)^nC_{r+1}$, then find k.
9. Shortest distance between the parabola $y^2 = 4x$ and $x^2 + y^2 - 4x - 16y + 64 = 0$ is equal to?
10. If $\cos 2x - a \sin x = 2a - 7$, then range of a is?
11. If $S = \{ z : |z + i| = |z - i| = |z - 1|, z \in C\}$, then the number of elements in Set S = ?
12. If α is a root of $x^2 + x + 1 = 0$ satisfying $(1 + \alpha)^7 = a + b\alpha + c\alpha^2$, then the order triplet (a, b, c) is:
13. If $f(x)= x^3 + 2x^2 * f'(1) + x * f''(2) + f'''(3)$. The value of $f'(10)$ is equal to?
14. $A = \{1,2,3,...,10\}$, S be the set of subsets of A and $R = \{(a,b): a, b \in S$ and $a \cap b \neq \emptyset\}$. Then R is
15. The shortest distance between the lines is?
    $(x - 1)/2 = (y + 1)/4 = (z - 1)/3$ and $(2x - 1)/5 = (y - 2)/3 = z/3$