

Note: Please select the most appropriate choice from A, B, C and D. No negative marking

MATHEMATICS

1. For the system of equations  $x + ky + z = 0$ ,  $kx + 3y - kz = 0$ ,  $x - y - 3z = 0$  to have only the trivial solution,  $k$  cannot be equal to  
 A) 2 and 3    B) -2 and 3    C) 2 and -3    D) -2 and -3
2. How many positive numbers  $x$  satisfy the equation  $\cos(97x) = x$ ?  
 A) 1    B) 15    C) 31    D) 49
3. The locus of the mid-point of the focal chord of the parabola  $y^2 = 4x$  is a parabola, whose vertex is  
 A) (0,0)    B) (1,0)    C) (0,1)    D) (1,1)
4. If two forces of magnitude 7 and 50 units act in the directions  $3\hat{i} + 2\hat{j} - 6\hat{k}$  and  $9\hat{i} - 12\hat{j} + 20\hat{k}$  respectively on a particle moving it from the point A (1, 0, -3) to the point B (3, -2, -5), then the work done by the forces is  
 A) 14 units    B) 27 units    C) 18 units    D) 24 units
5. One end-point of a diameter of the sphere  $x^2 + y^2 + z^2 - x - 2z = 1$  is (1, 1, 0). Then the other end-point of the diameter will be  
 A) (0, 1, 0)    B) (1, 1, 2)    C)  $(1, \sqrt{2}, 1)$     D) (0, -1, 2)
6.  $\lim_{x \rightarrow 0} (\cos x)^{1/x^2}$  is equal to  
 A)  $e^{-1}$     B) 1    C)  $e$     D)  $e^{-1/2}$
7. The bounded area cut-off by the line  $y - x + 4 = 0$  from the parabola  $y^2 = 2x$  is equal to  
 A)  $\frac{8}{3}$     B)  $\frac{14}{3}$     C)  $\frac{40}{3}$     D) 18
8. The general solution of the differential equation  $[\cos x \tan y + 2 \cos(x + y)] dx + [\sin x \sec^2 y + 2 \cos(x + y)] dy = 0$  is  
 A)  $\cos x \tan y - 2 \cos(x + y) = C$     B)  $\cos x \tan y + 2 \cos(x + y) = C$   
 C)  $\sin x \tan y - 2 \sin(x + y) = C$     D)  $\sin x \tan y + 2 \sin(x + y) = C$
9. A pair of coins is tossed a fixed number of times. If the probability of getting both heads exactly 3 times is same as the probability of getting both heads exactly 4 times, then the number of trials is  
 A) 7    B) 15    C) 21    D) 14
10. Consider the following statements  
 p : suman is brilliant  
 q : suman is rich  
 r : suman is honest  
 The negation of the statement "suman is brilliant and dishonest if and only if suman is rich" is equivalent to  
 A)  $(p \rightarrow r) \leftrightarrow q$     B)  $(r \rightarrow p) \leftrightarrow q$     C)  $p \rightarrow (r \leftrightarrow q)$     D)  $r \rightarrow (p \leftrightarrow q)$