**AIEEE Previous Years Papers Solutions**

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| [AIEEE Paper](http://www.askiitians.com/aieee/AIEEE-Past-Papers) > 2007-Mathematics Solutions  **AIEEE 2007 Mathematics Answers and Solutions**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **ANSWERS**   |  |  |  |  | | --- | --- | --- | --- | | 1) 4 | 2) 2 | 3) 4 | 4) 3 | | 5) 4 | 6) 3 | 7) 4 | 8) 2 | | 9) 1 | 10) 3 | 11) 4 | 12) 3 | | 13) 2 | 14) 1,4 | 15) 3 | 16) 1 | | 17) 2 | 18) 2 | 19) 4 | 20) 4 | | 21) 1 | 22) 2 | 23) 3 | 24) 2 | | 25) 4 | 26) 3 | 27) 3 | 28) 4 | | 29) 1 | 30) 4 | 31) 3 | 32) 1 | | 33) 3 | 34) 1 | 35) 3 | 36) 4 | | 37) - | 38) 1 | 39) 3 | 40) 3 |   **Some Important Hints and Solutions:**  **1.** nth term of the Geometric progression = an = arn-1  So, arn-1 = arn + arn+1  => i = r + r2  => r = 1/2(√5 - 1)    **2.**  sin-1(x/5) + cosec-1(5/4) = π/2  => sin-1(x/5) = π/2 - cosec-1(5/4) = π/2 - sin-1(4/5)  => sin-1(x/5) = cos-1(4/5) = sin-1(3/5)  => x = 3    **3.** nC4 an-4(-b)4 + nC5 an-5(-b)5 = 0  => a/b = (n-5+1)/5 = (n-4)/5    **4.**Number of ways to partition : 12C4 x 8C4 x 4C4 = 12!/(4!)3    **5.**x/2 - 1 must be between -1 and 1 , so  -1 ≤ x/2 - 1 ≤ 1 .......... (i)  and, cosx must be greater than 0, i.e  cosx > 0 ..................(ii)  By solving (i), 0 ≤ x ≤ 4  By solving (ii), π/2 < x < -π/2  So, x ∈ [ 0 , π/2 )    **6.  trignometric-diagram**  T2cosθ +T1sinθ = mg .....................(i)  T2sinθ = T1cosθ .....................(ii)  T2 = mgcosθ .....................(iii) By solving (ii) and (iii)  T1 = mg sinθ  tanθ = 5/12  So, T1 = 13kg x (5/13) = 5 Kg  And, T2 = 13kg x (12/13) = 12 Kg  **7.**  Probability of getting score 9 in a single throw = 4/36 = 1/9  Probability of getting sum nine exactly two times out of three draws = 3C2 (1/9)2(8/9) = 8/243    **8.**Equation of circle is: (x-h)2 + (y-k)2 = k2  The circle passes thru (-1,1), so  (-1-h)2 + (1-k)2 = k2  h2 + 2h -2k + 2 = 0  D ≥ 0  2k-1 ≥ 0  ⇒ k ≥ 1/2    **9.**  If direction cosines of L be l, m, n, then  2l + 3m + n = 0 ............(i)  l + 3m + 2n = 0 ............(ii)  By solving (i) and (ii)  l/3 = -m/3 = n/3  So, l:m:n = 1/√3 : -1/√3 : 1/√3  So, cosα = 1/√3    **10.**Equation of circle passing through origin and having their centres on x-axis is :  x2 + y2 + 2gx = 0 ............ (1)  2x + 2y dy/dx + 2g = 0  Replacing value of **g** from equation (i)  y2 = x2 + 2 xy dy/dx    **11.**  We know that:  Arithmetic Mean ≥ Geometric Mean. So  (p2 + q2)/2 ≥ pq  => 1/2 ≥ pq  => 1 ≥ 2pq  We know that  p2 + q2 + 2pq = (p+q)2  1 + 1 ≥ (p+q)2  => √2  ≥  (p+q)    **12.**  **equilateral-triangle** ∠ACB = 60°  ΔABC is an equilateral triangle  Radius of the circle = a  DC/AC = tan30°  DC = a/√3    **13.**  (1+x)20 = 20C0 + 20C1x + 20C2x2 + .... + 20C20x20  Let x = -1, then  0 = 20C0 - 20C1 + 20C2 + .... + 20C20  0 = 2(20C0 - 20C1 + 20C2 + .... - 20C9) + 20C10  20C0 - 20C1 + 20C2 + .... - 20C9 + 20C10 = (1/2)20C10  **14.**  Equation of normal at P(x,y) is : Y-y = (dy/dx) (X-x)  Co-ordinate of point G is (x+y(dy/dx) , 0)  |x+y(dy/dx)| = 2x ................ (i)  => y(dy/dx) = x **OR** y(dy/dx) = -3x  => y dy = x dx **OR** ydy= -3xdx  => y2/2 = x2/2 + c **OR** y2/2 = -3x2/2 + c  => x2 - y2 = -2c **OR** 3x2 + y2 = 2c    **15.**  circle  |z + 4| ≤ 3  => z can be on the circle or inside the circle of radius=3 and center at: (-4,0).  => So maximum value of |z+1| will be 6    **16.**  find-value-of-p  72 = P2 + 9 + 6Pcosθ  => 6Pcosθ = 40 - P2 ............................(i)  19 = P2 + 9 + 6Pcos(π - θ)  => 19 = P2 + 9 - 6Pcosθ ............................(ii)  Solving (i) and (ii)  19 = P2 + 9 - 40 + P2  So, P = 5N    **17.**  Required probability = 0.7 x 0.2 + (0.7) (0.8) (0.7) (0.2) + (0.7) (0.8) (0.7) (0.8) (0.7) (0.2) + ...  = 0.14 [ 1 + (0.56) + (0.56)2 + (0.56)3 + (0.56)4..... ]  = 0.14 (1/(1-0.56)) = 0.14/0.44 = 7/22    **18.**  **matrix-3**  Do following:  Column3 = Column3 - Column1  Column2 = Column2 - Column1  So,  matrix-2  So, D is divisible by x and y.    **19.  Eccentricity**: Eccentricity measures as how much the conic section deviates from being circular.  a2 = cos2α ................(i)  b2 = sin2α ................(ii)  b2 = a2(e2 - 1) ................(iii)  By solving (i), (ii) and (iii)  e = secα  coordinates of focii : (±ae , 0) = (±1 , 0)  Hence abscissae of foci remain constant when α varies.    **20.** cos2α + cos2β + cos2γ = 1  => cos2π/4 + cos2π/4 + cos2γ = 1  => 1/2 + 1/2 + cos2γ = 1  => cos2γ = 0  => γ = π/2    **21.**  f'(C) = (f(3)-f(1))/(3-1)  => 1/c = (loge3)/2  => c = 2log3e  **22.**   f(x) = tan-1(sinx + cosx)  f'(x) = (cosx - sinx)/( 1+(sinx + cosx)2 )  f'(x) = (√2 cos(x+π/4))/( 1+(sinx + cosx)2 )  So, f(x) increases if -π/2 < x + π/4 < π/2  => So, f(x) increases if -3π/4 < x < π/4  => So f(x) increases in x ∈ (-π/2 , π/4)    **23.**  matrix-4  |A . A| = |A|.|A| = (25α). (25α) = 25  So, α2 = 1/25  => α = ± 1/5    **24.**   e-x = 1 - x + X2/2! - x3/3! + x4/4! - .......  Repace x with 1, then  1/2! - 1/3! + 1/4!..... = e-1    **25.**   |2**u** × 3**v**| = 1  6|**u** × **v**| = 1  |**u** × **v**| = 1/6  sinθ = ±1/6  As θ is accute angle so θ can have only value    **26.**  angle-of-projection  a = u cosα t ................... (i)  b = u sinα t - 1/2 gt2 .........................(ii)  c = (u2 sin2α)/2 ..............................(iii)  Using (i) and (ii)  b = a tanα - (1/2)g (a2)/(u2cos2α) .........(iv)  Repacing value of u2 from (iii) in (iv)  b = (a tanα) - (a2g sin2α sec2α)/(2cg)  Use, sin2α = 2sinα cosα  b = a tanα - (a2 2tanα)/(2c)  tanα = (bc)/(a(c-a))    **27.**Let number of boys = x  number of girls - y  Total marks = 52x + 42y = 50 (x+y)  => 2x = 8y  => x = 4y  So percent of boys = 100x/(x+y) = 400y/(5y) = 80%    **28.**Point of intersection of two perpendicular tangents to the parabola must be on directrix of the parabola.  Equation of directrix is  x + 2 = 0  Hence the point is (-2, 0).    **29.** Coordinates of centre = (3,6,1)  Let coordinates of other end of the diameter is (α, β, γ)  So,  (α+2)/2 = 3  (β+3)/2 = 6  (γ+5)/2 = 1  So, α = 4  β = 9  γ = -3    **30.**  matrix-5  By solving above ,  2x + 4 = 0  x = -2  **31.**  right-angled-triangle  A = (1/2).1.|k-1| = 1  => k-1 = 2 OR k-1= -2  =>k = 3 OR k = -1  **32.**  bisector  Slope of QR = √3  So ∠PQR = 120°  Slope of QS = tan120° = -√3  So equation of QS will be  y=-√3 x    **33.** my2 + (1 - m2)xy - mx2 = 0  => my2 + m2xy + xy - mx2 = 0  => my(y-mx)+x(y-mx) = 0  => (my+x)(y-mx) = 0  => y=mx and y=(-1/m)x  So, m=±1    **34.**  **find-integration**  **35.**  function-f(x)  f(x) = Min { x + 1 , |x| , 1 }  (under progress)    **40.**  α+β=-a  and α.β=1  |α-β| < √5  => (α-β)2 < 5  => (α+β)2 - 4α.β < 5  => a2-4 < 5  => a ∈ (-3,3)   |  | | --- | |  |  |  | | --- | |  |  |  | | --- | |  | |