HORIZON ACADEMY®

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Name.: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Date : 30/08/2015

Test No.: 0 3

Test Code.: 1 1 1

Time : 3 Hrs. **M.M. : 360**

HORIZON TEST SERIES

for

Engineering Entrance Exam.

2016

[Test No. 3]

INSTRUCTIONS FOR STUDENTS

1. Read each question carefully.
2. It is mandatory to use Blue/Black Ball Point Pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should complete fill the circle.
4. Rough work must not be done on the Question Paper, no additional sheet will be provided for this purpose.
5. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
6. Student cannot use log tables and calculators or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Each correct answer carries four marks. One mark will be deducted for each incorrect answer from the total score.
9. Before handing over the answer sheet to the invigilator, candidate should check the particulars have been filled and marked correctly.
10. Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
11. Use of Calculator and other Electronic device is not permitted.

Test No. 3

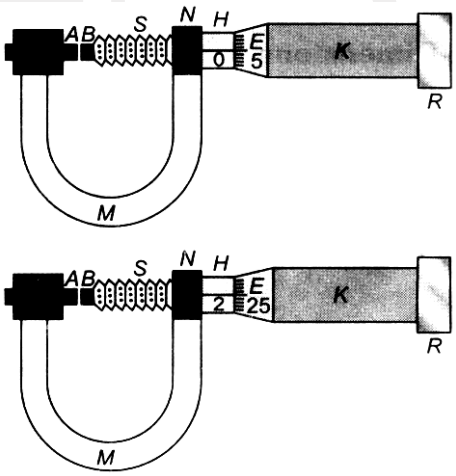
Topics of The Test

Physics	Unit, Dimension & Errors, Motion in 1D.
Chemistry	Atomic Structure.
Maths	Quadratic Equations & Inequation.

Test No. 3

[PHYSICS]

1. 1 Wb/m^2 is equal to
   (A) 10^4 gauss (B) $4\pi \times 10^{-3}$ gauss
   (C) 10^2 gauss (D) 10^{-4} gauss
2. Density of liquid in CGS system is 0.625 g cm^{-3}. What is its magnitude in SI system ?
   (A) 0.625 (B) 0.0625
   (C) 0.00625 (D) 625
3. The dimensions of gravitational constant G and the moment of inertia are respectively
   (A) $[ML^3T^{-2}]$; $[ML^2T^0]$
   (B) $[M^{-1}L^3T^{-2}]$; $[ML^2T^0]$
   (C) $[M^{-1}L^3T^{-2}]$; $[M^{-1}L^2T]$
   (D) $[ML^3T^{-2}]$; $[M^{-1}L^2T]$
4. The dimensions of magnetic field in M, L, T and C (coulomb) is given as
   (A) $[MLT^{-1}C^{-1}]$ (B) $[MT^2C^{-2}]$
   (C) $[MT^{-1}C^{-1}]$ (D) $[MT^{-2}C^{-1}]$
5. The physical quantity having the dimensions $[M^{-1}L^{-3}T^3A^2]$ is
   (A) resistance
   (B) resistivity
   (C) electrical conductivity
   (D) electromotive force
6. Which of the following units denotes the dimensions $[ML^2/Q^2]$, where Q denotes the electric charge ?
   (A) Wbm^{-2} (B) henry (H)
   (C) Hm^{-2} (D) weber (Wb)
7. Out of the following pairs, which one does not have identical dimensions ?
   (A) Angular momentum and Planck's constant
   (B) Impulse and momentum
   (C) Moment of inertia and moment of a force
   (D) Work and torque
8. A vernier callipers has 1 mm marks on the main scale. It has 20 equal divisions on the vernier scale which match with 16 main scale divisions. For this vernier callipers, the least count is
   (A) 0.02 mm (B) 0.05 mm
   (C) 0.1 mm (D) 0.2 mm
9. The circular scale of a screw gauge has 50 divisions and ptich of 0.5 mm. Find the diameter of sphere. Main scale reading is 2.



   (A) 1.2 (B) 1.25
   (C) 2.20 (D) 2.25
10. If error in radius is 3%, what is error in volume of sphere?
   (A) 3% (B) 27%
   (C) 9% (D) 6%

Space for Rough Work

11. The position coordinates of a particle moving in X-Y as a function of time *t* are

$x = 2t^2 + 6t + 25$

$y = t^2 + 2t + 1$

The speed of the object at $t = 10$ s is approximately

(A) 31 (B) 51

(C) 71 (D) 81

12. An aeroplane flies 400m north and 300m south and then flies 1200m upwards, then net displacement is

(A) 1500m (B) 1400m

(C) 1300m (D) 1200m

13. A car moves a distance of 200m. It covers first half of the distance at speed 60 kmh^{-1} and the second half at speed v. If the average speed is 40 kmh^{-1}, the value of v is

(A) 30 kmh^{-1} (B) 13 kmh^{-1}

(C) 60 kmh^{-1} (D) 40 kmh^{-1}

14. A body of mass m thrown horizontally with velocity v from the top of tower of height h, touches the level ground at distance of 250 m from the foot of the tower. A body of mass, 2 m thrown horizontally with velocity $\frac{v}{2}$, from the top of tower of height 4 h will touch the level ground at a distance x from the foot of tower. The value of x is

(A) 250 m (B) 500 m

(C) 125 m (D) $250\sqrt{2}$ m

15. A body of mass m moving along a straight line covers half the distance with a speed of 2ms^{-1}. The remaining half of distance is covered in two equal time intervals with a speed of 3 ms^{-1} and 5 ms^{-1} respectively. The average speed of the particle for the entire journey is

(A) $\frac{3}{8}$ ms^{-1} (B) $\frac{8}{3}$ ms^{-1}

(C) $\frac{4}{3}$ ms^{-1} (D) $\frac{16}{3}$ ms^{-1}

16. Two spheres of same size, one of mass 2 kg and another of mass 4 kg, are dropped simultaneously from the top of Qutab Minar (height = 72 m). When they are 1 m above the ground, the two spheres have the same

(A) momentum (B) kinetic energy

(C) potential energy (D) acceleration

17. The distance travelled by an object along a straight line in time *t* is given by $s = 3 - 4t + 5t^2$, the initial velocity of the object is

(A) 3 unit (B) –3 unit

(C) 4 unit (D) –4 unit

18. A bullet emerge from a barrel of length 1.2 m with a speed of 640 ms^{-1}. Assuming constant acceleration, the approximate time that is spends in the barrel after the gun is fired is

(A) 4 ms (B) 40 ms

(C) 400 μs (D) 1 s

19. The velocity of particle is $v = v_0 + gt + ft^2$. If its position is $x = 0$ at $t = 0$, then its displacement after unit time $(t = 1)$ is

(A) $v_0 + 2g + 3f$ (B) $v_0 + g/2 + f/3$

(C) $v_0 + g + f$ (D) $v_0 + g/2 + f$

20. Two balls are dropped to the ground from different heights. One ball is dropped 2 s after the other but they both strike the ground at the same time. If the first ball takes 5 s to reach the ground, then the difference in initial heights is (g = 10 ms^{-2})

(A) 20 m (B) 80 m

(C) 170 m (D) 40 m

21. Two bodies of different masses are dropped from heights of 16 m and 25 m respectively. The ratio of the time taken by them to reach the ground is

(A) $\frac{25}{16}$ (B) $\frac{5}{4}$

(C) $\frac{4}{5}$ (D) $\frac{16}{25}$

Space for Rough Work

22. An automobile travelling with a speed of 60 kmh^{-1}, can brake to stop within a distance of 20 m. If the car is going twice as fast, *ie.*, 120 kmh^{-1}, the stopping distance will be

(A) 20 m (B) 40 m
(C) 60 m (D) 80 m

23. The coordinates of a moving particle at any time *t* are given by $x = \alpha t^3$ and $y = \beta t^3$. The speed of the particle at time *t* is given by

(A) $3t\sqrt{\alpha^2 + \beta^2}$ (B) $3t^2\sqrt{\alpha^2 + \beta^2}$
(C) $t^2\sqrt{\alpha^2 + \beta^2}$ (D) $\sqrt{\alpha^2 + \beta^2}$

24. A particle located at x = 0 at time t = 0, starts moving along the positive x-direction with a velocity v that varies as $v = \alpha\sqrt{x}$. The displacement of the particle varies with time as

(A) t^2 (B) t
(C) $t^{1/2}$ (D) t^3

25. A parachutist after bailing out falls 50 m without friction. When parachute opens, it decelerates at 2 ms^{-2}. He reaches the ground with a speed of 3 ms^{-1}. At what height, did he bail out ?

(A) 91 m (B) 182 m
(C) 293 m (D) 111 m

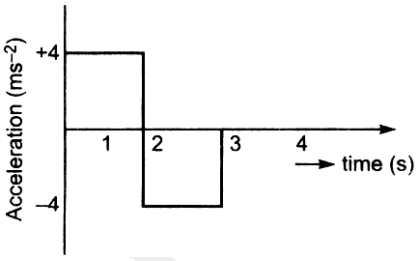
26. A particle moves for 20 s with velocity 3 ms^{-1} and then moves with velocity 4 ms^{-1} for another 20 s and finally moves with velocity 5 ms^{-1} for next 20 s. What is the average velocity of the particle ?

(A) 3 ms^{-1} (B) 4 ms^{-1}
(C) 5 ms^{-1} (D) zero

27. Two balls of same size but the density of one is greater than that of the other are dropped from the same height, then which ball will reach the earth first (air resistance is negligible) ?

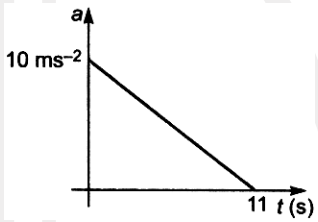
(A) Heavy ball
(B) Light ball
(C) Both simultaneously
(D) Will depend upon the density of the balls

28. A particle starts from rest at $t = 0$ and moves in a straight line with an acceleration as shown in figure. The velocity of the particle at t = 3s is



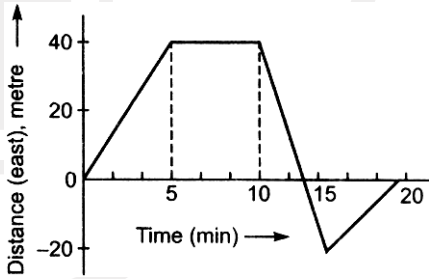
(A) 2 ms^{-1} (B) 4 ms^{-1}
(C) 6 ms^{-1} (D) 8 ms^{-1}

29. A particle starts from rest. Its acceleration (a) versus time (t) is as shown in the figure. The maximum speed of the particle will be



(A) 110 ms^{-1} (B) 55 ms^{-1}
(C) 550 ms^{-1} (D) 660 ms^{-1}

30. A boy beings to walk eastward along a street infront of his house and the graph of his displacement from home is shown in the following figure. His average speed for in the whole time interval is equal to



(A) 8 m min^{-1} (B) 6 m min^{-1}
(C) $\frac{8}{3}$ m min^{-1} (D) 2 m min^{-1}

Space for Rough Work

[CHEMISTRY]

31. Which one of the following sets of ions represents a collection of isoelectronic species ?
(A) K^+, Cl^-, Ca^{2+}, Sc^{3+}
(B) Ba^{2+}, Sr^{2+}, K^+, S^{2-}
(C) N^{3-}, O^{2-}, F^-, S^{2-}
(D) Li^+, Na^+, Mg^{2+}, Ca^{2+}

32. An isotone of $^{76}_{32}Ge$ is
(A) $^{77}_{32}Ge$ (B) $^{77}_{33}As$
(C) $^{77}_{34}Se$ (D) $^{78}_{36}Sc$

33. Isotopes are
(A) atoms of different elements having same mass number
(B) atoms of same elements having same mass number
(C) atoms of same elements having different mass number
(D) atoms of different elements having same number of neutrons

34. The electronic configuration of an element in ultimate and penultimate orbitals is
$(n\ 1)s^2(n\ 1)p^6(n\ 1)d^x ns^2$. If n 4 and x 5 then number of protons in the nucleus is
(A) 35 (B) < 724
(C) 25 (D) 30

35. A gas absorbs photon of 355 nm and emits at two wavelengths. If one of the emission is at 680 nm, the other is at
(A) 1035 nm (B) 325 nm
(C) 743 nm (D) 518 bm

36. The energy required to break one mole of Cl—Cl bonds in Cl_2 is 242 kJ mol^{-1}. The longest wavelength of light capable of breaking a single Cl—Cl bond is
(A) 594 nm (B) 640 nm
(C) 700 nm (D) 494 nm

37. The ionisation enthalpy of hydrogen atom is 1.312×10^6 J mol^{-1}. The energy required to excite the electron in the atom from $n_1 = 1$ to $n_2 = 2$ is
(A) 8.51×10^5 J mol^{-1} (B) 6.56×10^5 J mol^{-1}
(C) 7.56×10^5 J mol^{-1} (D) 9.84×10^5 J mol^{-1}

38. According to Bohr's theory, the angular momentum of an electron in 5th orbit is
(A) $25\frac{h}{\pi}$ (B) $1.0\frac{h}{\pi}$
(C) $10\frac{h}{\pi}$ (D) $2.5\frac{h}{\pi}$

39. The radius of hydrogen atom is 0.53 Å. The radius of $_3Li^{2+}$ is of
(A) 1.27 Å (B) 0.17 Å
(C) 0.57 Å (D) 0.99 Å

40. Which of the following statements does not form a part of Bohr's model of hydrogen atom ?
(A) Energy of the electrons in the orbit is quantised
(B) The electron in the orbit nearest the nucleus has the lowest energy
(C) Electrons revolve in different orbits around the nucleus
(D) The position and velocity of the electrons in the orbit cannot be determined simultaneously

41. Energy of H-atom in the ground state is –13.6 eV, hence energy in the second excited state is
(A) –6.8 eV (B) –3.4 eV
(C) –1.51 eV (D) –4.53 eV

42. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inner-orbit jumps of the electron for Bohr orbit in an atom of hydrogen ?
(A) $3 \rightarrow 2$ (B) $5 \rightarrow 2$
(C) $4 \rightarrow 1$ (D) $2 \rightarrow 5$

Space for Rough Work

43. If the ionisation potential for hydrogen atom is 13.6 eV, then the ionisation potential for He^+ ion should be
(A) 13.6 eV (B) 6.8 eV
(C) 54.4 eV (D) 72.2 eV

44. The H atom electron dropped from n = 3 to n = 2, then energy emitted is
(A) 1.9 eV (B) 12 eV
(C) 10.2 eV (D) 0.65 eV

45. In an atom, an electron is moving with a speed of 600 m/s with an accuracy of 0.005%. Certainity with which the position of the electron can be located is ($h = 6.6\times10^{-34}$ kg m^2s^{-1}, mass of electron, $e_m = 9.1\times10^{-31}$kg)
(A) 1.52×10^{-4} m (B) 5.10×10^{-3} m
(C) 1.92×10^{-3} m (D) 3.84×10^{-3} m

46. The velocity of two particles A and B are 0.05 and 0.02 ms^{-1} respectively. The mass of B is five times the mass of A. The ratio their de-Broglie's wavelength is
(A) 2 : 1 (B) 1 : 4
(C) 1 : 1 (D) 4 : 1

47. The de-Broglie wavelength of a tennis ball of mass 60g moving with a velocity of 10 m/s is approximately
(Planck's constant, $h = 6.63\times10^{-34}$ Js)
(A) 10^{-33} m (B) 10^{-31} m
(C) 10^{-16} m (D) 10^{-25} m

48. The mass of a photon with wavelength 3.6 Å is
(A) 6.135×10^{-29} kg (B) 3.60×10^{-29} kg
(C) 6.135×10^{-33} kg (D) 3.60×10^{-27} kg

49. Which one of the following sets of quantum numbers represents the highest energy level in an atom ?
(A) $n=4, l=0, m=0, s=+\frac{1}{2}$
(B) $n=3, l=1, m=1, s=+\frac{1}{2}$
(C) $n=3, l=2, m=-2, s=+\frac{1}{2}$
(D) $n=3, l=0, m=0, s=+\frac{1}{2}$

50. Which of the following is correct for number of electrons, number of orbitals and type of orbitals respectively in n-orbit ?
(A) 4,4 and 8 (B) 4,8 and 16
(C) 32,16 and 4 (D) 4,16 and 32

51. The orbital angular momentum of an electron in a d-orbital is
(A) $\sqrt{6}\frac{h}{2\pi}$ (B) $\sqrt{2}\frac{h}{2\pi}$
(C) $\frac{h}{2\pi}$ (D) $\frac{2h}{2\pi}$

52. In a multi-electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic and electric fields ?
(a) $n=1, l=0, m=0$
(b) $n=2, l=0, m=0$
(c) $n=2, l=1, m=1$
(d) $n=3, l=2, m=1$
(e) $n=3, l=2, m=0$
(A) (d) and (e) (B) (c) and (d)
(C) (b) and (c) (D) (a) and (b)

53. The number of orbitals present in the shell with n= 4 is
(A) 16 (B) 8
(C) 18 (D) 32

54. The electrons identified by quantum numbers
I. $n=4, l=1$ II. $n=4, l=0$
III. $n=3, l=2$ IV. $n=2, l=1$
Can be placed in order of increasing energy from the lowest to highest as
(A) IV<II<III<I
(B) II<IV<I<III
(C) I<III<II<IV
(D) III<I<IV<II

Space for Rough Work

55. What does the electronic configuration $1s^2, 2s^2, 2p^5, 3s^1$ indicate ?

(A) Ground state of fluorine

(B) Excited state of fluorine

(C) Excited state of neon

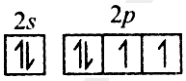
(D) Excited state of the O_2^- ion

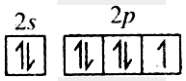
56. The total number of electrons present in all the 's' orbitals, all the 'p' orbitals and all the 'd' orbitals of cesium ion are respectively

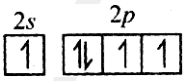
(A) 8, 26, 10 (B) 10, 24, 20

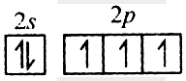
(C) 8, 22, 24 (D) 12, 20, 22

57. Which is not in accordance to aufbau principle ?

(A) 

(B) 

(C) 

(D) 

58. The highest number of unpaired electrons are in

(A) Fe

(B) Fe^{2+}

(C) Fe^{3+}

(D) all have equal number of unpaired electrons

59. Electrons will first enter into the set of quantum numbers $n = 5, l = 0$ or $n = 3, l = 2$

(A) $n = 5, l = 0$ (B) both possible

(C) $n = 3, l = 2$ (D) data insufficient

60. The ground state term symbol for an electronic state in governed by

(A) Heisenberg's principle

(B) Hund's rule

(C) Aufbau principle

(D) Pauli exclusion principle

[MATHEMATICS]

61. One of the square roots of $6 + 4\sqrt{3}$ is

(A) $\sqrt{3}(\sqrt{3}+1)$ (B) $-\sqrt{3}(\sqrt{3}-1)$

(C) $\sqrt{3}(-\sqrt{3}+1)$ (D) None of these

62. If $x = \frac{1}{2}\left(\sqrt{7} + \frac{1}{\sqrt{7}}\right)$, then $\frac{\sqrt{x^2-1}}{x-\sqrt{x^2-1}}$ is equal to

(A) 1 (B) 2

(C) 3 (D) 4

63. If $x = \sqrt{3018 + \sqrt{36 + \sqrt{169}}}$, then the value of x is

(A) 55 (B) 44

(C) 63 (D) 42

64. The value of $\frac{\log_3 5 \times \log_{25} 27 \times \log_{49} 7}{\log_{81} 3}$ is

(A) 1 (B) 6

(C) $\frac{2}{3}$ (D) 3

65. If $a^x = b^y = c^z = d^w$, then the value of $x\left(\frac{1}{y} + \frac{1}{z} + \frac{1}{w}\right)$ is

(A) $\log_a(abc)$ (B) $\log_a(bcd)$

(C) $\log_b(cda)$ (D) $\log_c(dab)$

66. The solution of $\log_{99}\{\log_2(\log_3 x)\} = 0$ is

(A) 4 (B) 9

(C) 44 (D) 99

67. If $\log_2[\log_3\{\log_4(\log_5 x)\}] = 0$, then the value of x is

(A) 5^{24} (B) 1

(C) 2^{25} (D) 5^{64}

Space for Rough Work

68. Let p and q be real numbers such that $p \neq 0, p^3 \neq q$ and $p^3 \neq -q$. If α and β are non-zero complex numbers satisfying $\alpha+\beta=-p$ and $\alpha^3+\beta^3=-q$, then a quadratic equation having $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ as its roots is

(A) $(p^3+q)x^2-(p^3+2q)x+(p^3+q)=0$

(B) $(p^3+q)x^2-(p^3-2q)x+(p^3+q)=0$

(C) $(p^3-q)x^2-(5p^3-2q)x+(p^3-q)=0$

(D) $(p^3-q)x^2-(5p^3+2q)x+(p^3-q)=0$

69. If α,β are the roots of the equation $\lambda(x^2-x)+x+5=0$ and if λ_1 and λ_2 are two values of λ obtained from $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{4}{5}$, then $\frac{\lambda_1}{\lambda_2^2}+\frac{\lambda_2}{\lambda_1^2}$ is equal to

(A) 4192 (B) 4144

(C) 4096 (D) 4048

70. If α,β be the roots of $x^2-a(x-1)+b=0$, then the value of $\frac{1}{\alpha^2-a\alpha}+\frac{1}{\beta^2-a\beta}+\frac{2}{a+b}$ is

(A) $\frac{4}{a+b}$ (B) $\frac{1}{a+b}$

(C) 0 (D) –1

71. If $\alpha+\beta=-2$ and $\alpha^3+\beta^3=-56$, then the quadratic equation whose roots are α and β is

(A) $x^2+2x-16=0$ (B) $x^2+2x+15=0$

(C) $x^2+2x-12=0$ (D) $x^2+2x-8=0$

72. If α,β and γ are the roots of the equation $x^3-8x+8=0$, then $\sum\alpha^2$ and $\sum\frac{1}{\alpha\beta}$ are respectively

(A) 0 and –16 (B) 16 and 18

(C) –16 and 0 (D) 16 and 0

73. If $\sin\alpha$ and $\cos\alpha$ are the roots of the equation $px^2+qx+r=0$, then

(A) $p^2+q^2-2pr=0$ (B) $p^2-q^2+2pr=0$

(C) $p^2-q^2-2pr=0$ (D) $p^2+q^2+2qr=0$

74. The quadratic equation whose roots are $\sin^2 18^\circ$ and $\cos^2 36^\circ$, is

(A) $16x^2-12x+1=0$

(B) $16x^2+12x+1=0$

(C) $16x^2-12x-1=0$

(D) $16x^2+10x+1=0$

75. If α and β are the solutions of the quadratic equation $ax^2+bx+c=0$ such that $\beta=\alpha^{1/3}$, then

(A) $(ac)^{1/3}+(ab)^{1/3}+c=0$

(B) $(a^3b)^{1/4}+(ab^3)^{1/4}+c=0$

(C) $(a^3c)^{1/4}+(ac^3)^{1/4}+b=0$

(D) $(a^4c)^{1/3}+(ac^4)^{1/3}+b=0$

76. If p,q,r are positive and are in AP, then roots of the quadratic equation $px^2+qx+r=0$ are complex for

(A) $\left|\frac{r}{p}-7\right|\geq 4\sqrt{3}$ (B) $\left|\frac{p}{r}-7\right|<4\sqrt{3}$

(C) all p and r (D) no p and r

Space for Rough Work

77. If the difference between the roots of the equation $x^2+ax+1=0$ is less than $\sqrt{5}$, then the set of possible values of a is

(A) $(-3, 3)$ (B) $(-3,\infty)$

(C) $(3,\infty)$ (D) $(-\infty,-3)$

78. If $(1-p)$ is a root of quadratic equation $x^2+px+(1-p)=0$, then its roots are

(A) 0, 1 (B) –1, 1

(C) 0, –1 (D) –1, 2

79. If a,b,c are the sides of a triangle ABC such that $a\neq b\neq c$ and

$x^2-2(a+b+c)x+3\lambda(ab+bc+ca)=0$ has real roots, then

(A) $\lambda<\frac{4}{3}$ (B) $\lambda>\frac{5}{3}$

(C) $\lambda\in\left(\frac{4}{3},\frac{5}{3}\right)$ (D) $\lambda\in\left(\frac{1}{3},\frac{5}{3}\right)$

80. The roots of the equation $x^4-2x^3+x=380$ are

(A) $5,-4,\frac{1\pm5\sqrt{-3}}{2}$ (B) $-5,4,\frac{-1\pm5\sqrt{-3}}{2}$

(C) $5,4,\frac{-1\pm5\sqrt{-3}}{2}$ (D) $-5,-4,\frac{1\pm5\sqrt{3}}{2}$

81. If the cube roots of unity are 1, ω,ω^2, then the roots of the equation $(x-2)^3+27=0$ are

(A) $-1,-1,-1$

(B) $-1,-\omega,-\omega^2$

(C) $-1,2+3\omega,2+3\omega^2$

(D) $-1,2-3\omega,2-3\omega^2$

82. If the roots of the equation $bx^2+cx+a=0$ be imaginary, then for all real values of x, the expression $3b^2x^2+6bcx+2c^2$ is

(A) greater than 4ab (B) less than 4ab

(C) greater than –4ab (D) less than –4ab

83. If α,β,γ are the roots of $x^3+4x+1=0$, then the equation whose roots are $\frac{\alpha^2}{\beta+\gamma},\frac{\beta^2}{\gamma+\alpha},\frac{\gamma^2}{\alpha+\beta}$ is

(A) $x^3-4x-1=0$ (B) $x^3-4x+1=0$

(C) $x^3+4x-1=0$ (D) $x^3+4x+1=0$

84. If x is real, then $\frac{x^2-2x+4}{x^2+2x+4}$ takes values in the interval

(A) $\left[\frac{1}{3},3\right]$ (B) $\left(\frac{1}{3},3\right)$

(C) (3, 3) (D) $\left(-\frac{1}{3},3\right)$

85. If both the roots of the quadratic equation $x^2-2kx+k^2+k-5=0$ are less than 5, then k lies in the interval

(A) [4, 5] (B) $(-\infty,4)$

(C) $(6,\infty)$ (D) (5, 6]

86. $\frac{3x^2+1}{x^2-6x+8}$ is equal to

(A) $3+\frac{49}{2(x-4)}-\frac{13}{2(x-2)}$

(B) $\frac{49}{2(x-4)}-\frac{13}{2(x-2)}$

(C) $\frac{-49}{2(x-4)}+\frac{13}{2(x-2)}$

(D) $\frac{49}{2(x-4)}+\frac{13}{2(x-2)}$

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87. If $\frac{(x+1)}{(2x-1)(3x+1)} = \frac{A}{(2x-1)} + \frac{B}{(3x+1)}$, then $16A + 9B$ is equal to

(A) 4 (B) 5

(C) 6 (D) 8

88. If $x^2 + 2ax + 10 - 3a > 0$ for all $x \in R$, then

(A) $-5 < a < 2$ (B) $a < -5$

(C) $a > 5$ (D) $2 < a < 5$

89. If $\frac{2x}{2x^2 + 5x + 2} > \frac{1}{x+1}$, then

(A) $-2 > x > -1$ (B) $-2 \geq x \geq -1$

(C) $-2 < x < -1$ (D) $-2 < x \leq -1$

90. Let $x = \left[\frac{a+2b}{a+b}\right]$ and $y = \frac{a}{b}$, where a and b are positive integers. If $y^2 > 2$, then

(A) $x^2 \leq 2$ (B) $x^2 < 2$

(C) $x^2 > 2$ (D) $x^2 \geq 2$

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