No.1 for IIT foundation in India

SRI SRI ACADEMY

Since 2001

HYDERABAD : : Ph. 9985072333

IIT Ramaiah SAT Model Question Paper - 2020

Time : 3 Hrs. Marks: 360

Each Question has 4 choices (a), (b), (c) and (d) - out of which ONE or MORE THAN ONE CORRECT.

For correct answer +4 marks & - 1 mark for wrong answers.

1. If $\sum_{n=2}^{2020} \frac{1}{1+2+3+4+....+r} = \frac{x}{y}$ where

x,y are positive integers and Co-primes, then $|x - y|$ =

a) 2019 b) 2021 c) 2 d) 0

2. The Value of $\sum_{i=1}^{2020} \frac{1}{(i^2+i)}$

a) $\frac{2020}{2021}$ b) $\frac{2019}{2020}$ c) $\frac{2021}{2020}$ d) $\frac{2018}{2019}$

3 The last digit in the expansion of 7^{2019} is

a) 1 b) 3 c) 7 d) 9

4.

If ABCD is a parallelogram then y - x= _____

a) 45^0 b) 90^0 c) 135^0 d) 180^0

5. A cubic polynomial P(x) when divided by x+3 and x - 3 leaves remainders 4 and 12 respectively, then the

remainder obtained when P $|x|$ is divided by $x^2 - 9$ is

a) $\frac{3}{2}x+6$ b) $\frac{2}{3}x+6$ c) $\frac{-3}{2}x+6$ d) none

6. The sum of first 24 terms of the A.P. $a_1, a_2, a_3, \ldots\ldots$ If it is known that $a_1+a_5+a_{10}+a_{15}+a_{20}+a_{24} = 225$ is

a) 865 b) 900 c) 930 d) None of these

7. The minimum value of $9\sec^2\theta + 16\operatorname{cosec}^2\theta$ is

a) 98 b) 24 c) 49 d) 48

8. The vertices of a Δ ABC are A(5,2), B(6,5), C(2,3). The equation of bisectors $\angle BAC$ of Δ ABC is

a) 2x+y+12=0 b) x+2y-12=0

c) x+y+12=0 d) 2x+y-12=0

9. Two sets A and B have 'm' and 'n' elements respectively. If 3 elements of A are same as that of B and the remaining are distinct, then the number of subsets of $A \cup B$ is 1024 where m + n=

a) 10 b) 11 c) 12 d) 13

10. The number of real values of 'k' for which the lines (k+1)x+3y+4=0 and 6x+(k - 2)y+13=0 intersect is

a) 0 b) 1 c) c d) infinite

11. If $[x]$ denotes the greatest integer less than or equal to 'x' then what is the value of $\sum_{k=1}^{2020}\left[\frac{k}{1010}\right]$?

a) 1010 b) 2020 c) 1009 d) 1011

12. If A is the set of the divisors of the number 15, B is the set of prime numbers smaller than 10 and C is the set

of even numbers smaller than 9, then $(A \cup C) \cap B$ is the set
a) $\{1,3,5\}$ b) $\{1,2,3\}$ c) $\{2,3,5\}$ d) $\{2,5\}$

13. A quadratic equation has two roots α and β where $\alpha^3 + \beta^3 = 152, \alpha\beta = 15$ then the quadratic equation is
a) $x^2+8x+15=0$ b) $x^2-6x+15=0$
c) $x^2-8x+15=0$ d) $2x^2+5x+30=0$

14. If f(x) is divided by (x-1), (x+1) and (2x-1), then the remainders are 2, 3 and -1 respectively. Then the remainder when f(x) is divided b $(2x^3-x^2-2x+1)$ is

a) $\frac{26x^2-3x-11}{6}$ b) $\frac{26x^2-3x-11}{3}$

c) $\frac{26x^2-3x-11}{2}$ d) $\frac{26x^2+3x-11}{6}$

15. Two cars A and B are travelling with speed 60 Kmph and 72 Kmph respectively. Initially they are at two towns P and Q. They are travelling in opposite direction. If they can meet each other in 5 hrs then the distance between the towns P and Q (in Km) is
a) 60 b) 600 c) 660 d) 720

16. $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}+\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}+\frac{2}{2\cos^2\theta-1} =$

a) 1 b) -1 c) 0 d) 2

17. Let $f(x)= \sum_{r=0}^{6} a_r x_r$, where $a_0=1$ and and f(x)= k for

k = 1,2,3,…..6 that f (7) =

a) 7! b) 6! c) 7 d) 8

18. A steel wire having 0.25cm as the radius of its circular section is one meter long. It is melted and spherical balls of radius

0.25cm are made. The number of the balls that can be made is
(a) 250 (b) 300 (c) 350 (d) 2400

19. X's salary is half that of Y's. If X got a 50% rise in his salary and Y got 25% rise in his salary then the percentage increase in combined salaries of both is
a) 30 b) $33\frac{1}{2}$ c) $37\frac{1}{2}$ d) 75

20. If $|4x+3| > 7$ for $x \in R$, then the solution set is given by
(a) $\{x \in R : 1 < x < -5/2\}$
(b) $\{x \in R : -1 < x < 5/2\}$
(c) $\{x \in R : x < 1\} \cup \{x \in R : x < -5/2\}$
(d) $\{x \in R : x < 1\} \cup \{x \in R : x < -5/2\}$

21. The vertices of a triangle PQR have coordinates as follows: P(0,a), Q(b,0), R(c,d) where a, b, c and d are positive. The origin and point A lie on opposite sides of PQ. The area of triangle PQR may be found from the expression

(a) $\frac{ab+ac+bc+cd}{2}$ (b) $\frac{ab+ad-ab}{2}$

(c) $\frac{ab-ac-bd}{2}$ (d) $\frac{ac+bd+ab}{2}$

22. If the radius vector OP makes angle q with the positive direction of the x-axis, where P is the point (-5, 12), then
(a) sin q = 12/13, cos q = 5/13, tan q = -12/5
(b) sin q = 5/13, cos q = 12/13, tan q = 12/5
(c) sin q = 12/13, cos q = -5/13, tan q = 5/12
(d) sin q = 12/13, cosq = 5/13, tan q = 12/5

23. $\sqrt{x-a}+\sqrt{x-5}=0$, then a is a solution of
a) $x^2-6x+5 = 0$ b) $x^2-7x+10 = 0$
c) $x^2-x+1> 0$ d) $x^2+x+1 > 0$

24. $ax^2+bx+c=0$ is a quadratic equation, a,b,c are rational numbers. $\Delta = b^2 - 4ac$.
a) Roots of the equation are always real
b) If $\Delta = k^2$, k is rational, then roots are rational
c) If $\Delta \neq k^2$, k is rational, then the roots are rational conjugates
d) Roots of the equation are always rational

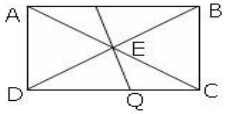
25. If $A=(\cos x+\sin x)^2 + (\cos x-\sin x)^2$,
$B=2(\cos^6 x + \sin^6 x) - 3(\cos^4 x+\sin^4 x) + 1$ then
a) A = B b) $A^2 + B = 4$
c) $A^2 - B^2 = 4$ d) $(1+2A-5A^2+6A^3)(B^2-3B)=0$

26. For the function $f(x)= \sqrt{x^2-3x+2}+\sqrt{3x-x^2-2}$
a) domain is [1,2] b) domain is {1, 2}
c) range is {0} d) None

27. If $p = \frac{s}{(1+k)^n}$ then 'n' equals:
(a) $\frac{\log(s/p)}{\log(1+k)}$ (b) $\log \frac{s}{(1+k)}$
(c) $\log \frac{s-p}{(1+k)}$ (d) $\log \frac{s}{p}$ + log (1 + k)

28. Area of quadrilateral formed by the vertices (-1, 6), (-3, -9)) (5, -8) and (3, 9) is
a) 81 sq units b) 18 sq units
c) 50 sq units d) 25 sq units

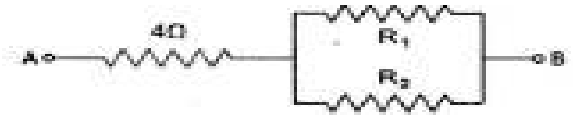
29. Quadrilateral ABCD is parallelogram. E is the midpoint of the diagonal DB.DE =10 cm, DB= 16 cm. The length PQ is:



a) 13 cm b) 16 cm c) 8 cm d) 12 cm

30. If a, b and c are distinct positive real numbers and $a^2 + b^2 + c^2 = 1$, then ab + bc +ca is
(a) less than 1 (b) equal to 1
(c) greater than 1 (d) any real number

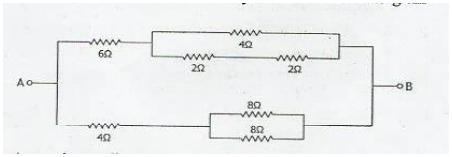
31. Resistances R_1 and R_2 are in the ratio 1:2. Equivalent resistance between A and B is 8 W. Find R_1 and R_2. If R_1 is now doubled and a potential difference of 20 V is applied between A and B find the current flowing from A to B.



(a) 3A (b) 2A (c) 5A (d) 6A

32. A steel wire of length 'l' has a magnetic moment, M. It is then bent into a semicircular arc. The new magnetic mo ment is
a) M b) 2M/p c) M/p d) pM

33. Potential difference between A and B is 16 V. Find the currents in the 6 &! and 8 &! Resistances



(a) 1A (b) 2A (c) 5A (d) 0.5A

34. Electric supply of a house is through 10 A fuse, at 220V through the heater and bulbs. A 1000 W heater is used in this house. The number 40W bulbs that can be used simultaneously is:

a) 10 b)20 c)30 d)40

35. Two capacitors connected in parallel having the capacities C_1 and C_2 are given a charge of q which is distributed among them . The ratio of the charges on C_1 and C_2 will be
a) $1/ C_1 C_2$ b) C_1 / C_2 c) C_2 / C_1 d) C_1 / C_2

36. Equal volumes of two miscible liquids of relative densities 6 and 2 are mixed to form a homogenous mixture. A cube floats on this liquid mixture with half its volume submerged. If instead equal masses of these liquids were mixed, find the fraction of the volume of the cube that would submerge in the mixture.
(a) $4/3$ (b) $1/3$ (c) $2/3$ (d) $5/3$

37. A piece of metal weighs 45N in air and 28.3N when fully submerged in water. The specific gravity of the metal is
a) 2.69 b) 3.19 c) 4.2 d) 11.22

38. The ratio of electric force between two electrons to two protons separated by the same distance in air is
a) 10^0 b) 10^6 c) 10^4 d) none of the above

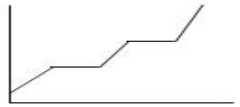
39. Two charges of 50 μ C and 100 μ C are separated by a distance of 0.6m. What is the intensity of electric field at point midway between them?
a) $5\times10^6 N/C$ towards $50\mu C$
b) $5\times10^3 N/C$ towards $50\mu C$
c) $5\times10^6 N/C$ towards $100\mu C$
d) $5\times10^3 N/C$ towards $100\mu C$

40. A straight conductor carries a current vertically upward. A charged particle moving horizontally towards the wire is at an instant located to the east of the wire. The direction of the magnetic field at the position of the charged particle and the

direction of the force on it.
a) Filed is towards north and force downward
b) Filed is towards north and force upward
c) Filed is towards south and force downward
d) Filed is towards south and force upward

41. When 400 gm of water at 30°C is mixed with 150 gm of water at 25°C contained in a calorimeter, the final temperature is found to be 27°C. The water equivalent of the calorimeter in the same units is
a) 350 b) 450 c) 550 d) 250

42. Calculate the amount of heat required to convert 1 g ice and 0^0C into steam at 100^0C.



a) 200 cal b) 716 cal c) 100 cal d) 500 cal

43. A block A of mass m moving with a constant velocity v along a smooth horizontal floor collides with another block B of mass 7 m and rebounds with a velocity 2v/5, the velocity of block B after collision is
a) v/3 b) v/5 c) 2v/5 d) 3v/5

44. A particle is moving along a straight line with constant acceleration. If the distance travelled by the body between n^{th} and $(n+1)^{th}$ seconds is 100m, then it's velocity at the end of the n^{th} second is
a) 20m/s b) 50m/s c) 30m/s d) 70m/s

45. A car travels from A to B covering half the distance at v_1 and the remaining half of the distance at v_2. This car then returns from B to A at v_3. If the time taken for the return journey from B to A is half of the time taken to go from A to B, the relation between v_1, v_2 and v_3 is

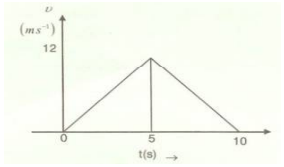
a) $\frac{1}{v_1}-\frac{1}{v_2}=\frac{4}{v_3}$ b) $\frac{1}{v_1}+\frac{1}{v_2}=\frac{4}{v_3}$

c) $\frac{1}{v_1}+\frac{4}{v_2}=\frac{1}{v_3}$ d) $\frac{1}{v_1}+\frac{1}{v_2}=\frac{1}{v_3}$

46. A body moves with a uniform velocity of 5 ms^{-1} from a point. From the same point at the same time another body starts from rest and moves with uniform acceleration of 2 ms^{-2} in the same direction. When and where do they meet each other?
a) 5 s, 20 m b) 5 s, 10 m
c) 10 s, 25 m d) 5 s, 25 m

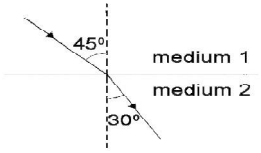
47. A nucleus ${}_nX^m$ emits one α and two β particles, the resulting nucleus is :
a) ${}_nX^{m-4}$ b) ${}_nZ^{m-4}$ c) ${}_{n-2}Y^{m-4}$ d) ${}_{z-4}Z^{m-4}$

48. The speed time graph of a particle moving in a fixed direction is as shown in the figure. The distance traversed by the particle between t = 0 to t = 5 s is



a) 24 m b) 30 m c) 36 m d) 40 m

49. A ray of light incident at the boundary of two media travels along the path shown. Find the angle in the denser medium if the angle in the rarer medium is doubled.



(a) 20° (b) 10° (c) 45° (d) 30°

50. Nucleus of an atoms whose atomic mass is 24 consists of :
a) 11 electrons , 11 protons and 13 neutrons
b) 11 electrons , 13 protons, and 11 neutrons
c) 11 protons and 13 neutrons
d) 11 protons and 11 electrons

51. For which of the following cases does the reaction go to nearly completion
a) K=1 b) $K=10^{-10}$
c) $K=10^{10}$ d) none of these

52. For the reaction, the equilibrium constant values are given
A $\rightleftharpoons$ B, K_1=2;B $\rightleftharpoons$ C, K_2 = 4;
C $\rightleftharpoons$ D,K_3=3. The equilibrium constant for the reaction
A $\rightleftharpoons$ D is
a) 48 b) 24 c) 6 d) 12

53. 80% of a first order chemical reaction completed in 100 sec., what time it will take for the completion of 99.2%
a) 200 sec b) 400 sec c) 300 sec d) 150 sec

54. Which pair of species has same percentage of carbon
a) CH_3COOH and $C_6H_{12}O_6$ b) CH_3COOH and C_2H_5OH
c) $HCOOCH_3$ and $C_{12}H_{22}O_{11}$ d) $C_6H_{12}O_6$ and $C_{12}H_{22}O_{11}$

55. One of the Phosphorus compound is popularly used as rat poison. The oxidation number of the Phosphorus in this compound is
a) Zero b) -2 c) -3 d) +2

56. Which of the following pairs carry same no. of electrons, but electronic configuration is not same
a) Cr^+, Mn^{+2} b) Fe^{+3}, Mn^{+2}

c) Co^{+3}, Ni^{+4} d) Cu^{+1}, Ni

57. The periodic table consists of 18 groups. An isotope of copper on bombardment with protons undergoes a nuclear reaction yielding element 'x' as shown below.To which group, the element X-belongs in the period table

$^{63}_{29}Cu + {}^{1}_{1}H \rightarrow 6\,{}^{1}_{0}n + \alpha + 2\,{}^{1}_{1}H + X$

a) 10th group b) 18th group
c) 8th group d) 11th group

58. The first I.P values of three elements are 1314, 1680, 2080 kjm^{-1}. The correct sequence of elements is
a) F, O and Ne b) F, Ne and O
c) F, Ne and O d) O, F and Ne

59. First four ionization energy values of an element are 191, 578, 872 and 5972 k.cals. The number of valency electrons in the element is
a) 4 b) 3 c) 1 d) 2

60. The molality and mole fraction of the solute in an aqueous solution containing 6 gm of urea per 500 gm of water (mol. wt. of urea=60)
a) 0.1 M, 0.001 b) 0.2 M, 0.00359
c) 0.3 M, 0.2 d) 0.01, 0.0012

61. The molarity of resultant solution when 100 ml of 0.3 M HNO_3 and 200 ml of 0.3 M H_2 solution mixed together
a) 0.4 M b) 0.2M c) 0.3 M d) 0.12 M

62. The correct order of anions present for the following CaC_2, Al_4C_3, Mg_2C_3
a) C^{-4}, C_2^{-2}, C_3^{-} b) C_2^{-2}, C_3^{-4}, C_3^{-2}
c) C_2^{-2}, C^{-4}, C_3^{-4} d) C^{-4}, C_2^{-2}, C_3^{-4}

63. A metal M reacts with nitrogen gas to afford M_3N.

M_3N on heating at high temperature gives back M and on reaction with water produces gas B. Gas B reacts with aqueous solution of $CuSO_4$ to form a deep blue compound. M and B respectively
a) Li and NH_3 b) Al and N_2
c) Ba and N_2 d) Na and NH_3

64. Alkaline earth metal compounds are less soluble in water than the corresponding alkali metal compounds, because alkali metals have
a) lower lattice energy b) Higher ionization energy
c) Higher covalent character d) Higher ionic character

65. Now a days there is very important world wide discussion about Environmental pollution and global warming, the Global warming is mainly due to
a) UV radiation b) VIS radiation
c) IR radiation d) Depletion of ozone layer

66. Ionic product of water at 25^0C is 10^{-14}. If an acid is added to this water the value of ionic product becomes.
a) 10^{-12} b) 10^{-10}
c) Remains as 10^{-14} d) Becomes equal to 10^{-7}

67. Which of the following contains electro valant linkage?
a) NH_3 b) BCl_3 c) PCl_5 d) Mg O

68. IUPAC name of $(CH_3)_3$ CH is
a) Trimethyl methane b) Isobutane
c) Methyl propane d) Propane

69. Which of the following compound(s) liberate gason reaction with water?
a) Mg_3N_2 b) CaC_2 c) CaH_2 d) Ca_3P_2

70. NH_4^+ ion in aqueous solution will behave as.
a) a base b) an acid
c) both acid and base d) neutral