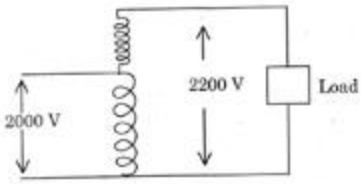
## SECTION (A) : TECHNICAL

1. A 25 KVA, 2000/200 V, two winding transformer is connected as shown in fig.



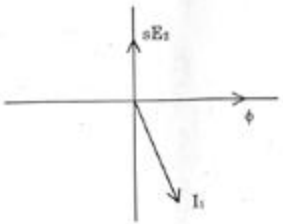

The full load KVA of connection is

(A) 125 (B) 275 (C) 375 (D) 175

2. A single phase transformer has resistance and reactance of 0.2 pu and 0.6 pu respectively. Its pu voltage regulation at 0.8 pf lagging would be

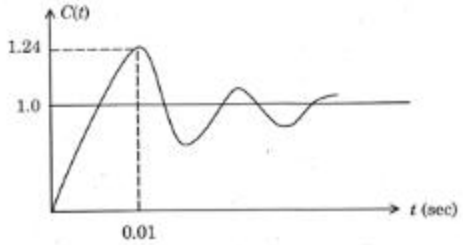
(A) 0.52 (B) 0.42 (C) 0.62 (D) 0.36

3. Given the following phasor diagram of induction machine, identify its mode of operation




| | Mode ↓ | Speed ↓ |
|---|---|---|
| (A) | Motoring | > Ns |
| (B) | Generating | > Ns |
| (C) | Motoring | < Ns |
| (D) | Generating | < Ns |

4. The damping ratio of the second order system which has the unit step response as shown in figure is

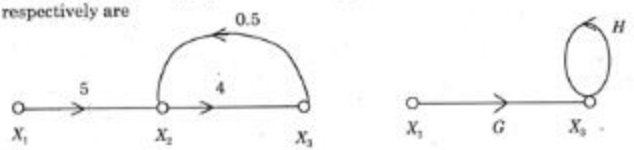



(A) 1 (B) 2 (C) 0.414 (D) zero

5. An example of a bounded signal is

(A) $e^{-at}$ (B) $e^{2t}$ (C) $t$ (D) $e^{t}\sin t$

6. The two signal flow graphs shown in figure are equivalent. The value of $G$ and $H$ respectively are




(A) 9, 4.5 (B) 9, 3.5 (C) 20, 8 (D) 20, 2

7. A transfer function has a second order denominator and constant gain in the numerator

(A) the system has two zeros at the origin (B) the system has two finite zeros

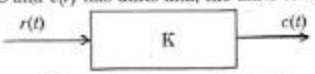
(C) the system has two zeros at infinity (D) the system has one zero at infinity

8. A system is linear if and only if it satisfies

(A) principle of superposition (B) principle of homogeneity

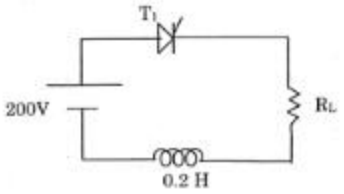
(C) both (A) and (B) above (D) neither (A) and (B) above

9. If $r(t)$ has units °C and $c(t)$ has units mm, the units of K in the figure shown are




(A) °C (B) mm/°C (C) mm (D) °C/mm

10.




The latching current of $T_1$ is 1 mA. The minimum width of gate pulse required to turn on SCR is

(A) 2 $\mu$sec (B) 1 $\mu$sec (C) 0.5 $\mu$sec (D) 1.5 $\mu$sec

11. A single phase fully controlled rectifier has an average output voltage of 200 V when $\alpha = 0$. Its output voltage when $\alpha = 30°$ is approximately

(A) 200 V (B) 160 V (C) 173 V (D) 183 V

12. A 200 V dc-dc converter is turned ON for 30 $\mu$sec and turned off for 10 $\mu$sec. The output voltage will be

(A) 200 V (B) 150 V (C) 175 V (D) 120 V

13. In single pulse modulation used in PWM inverters, for eliminating third harmonic component in the output voltage, the pulse width should be

(A) 60° (B) 90° (C) 110° (D) 120°

14. The dynamic resistance of a p-n junction germanium diode at room temperature with current of 1 mA under forward biasing is

(A) 100 Ω (B) 13 mΩ (C) 13 Ω (D) 26 Ω

15. Thermal runway is not possible in FET because as temperature of FET increases

(A) mobility increases (B) mobility decreases

(C) drain current decreases (D) transconductance increases

16. Auto reclosing is used in case of

(A) lightning arrester (B) bulk oil C.B

(C) air blast C.B (D) minimum oil C.B

17. A transmission line has 1 P.U impedance on a base of 11 KV, 100 MVA. On a base of 55 KV, it will have a P.U impedance of

(A) 1 P.U (B) 0.2 P.U (C) 0.02 P.U (D) 0.1 P.U

18. A 50 Hz, 4 pole turboalternator rated at 20 MVA, 13.2 KV has an inertia constant H = 4 KW sec/KVA. The K.E. stored in the rotor at synchronous speed is

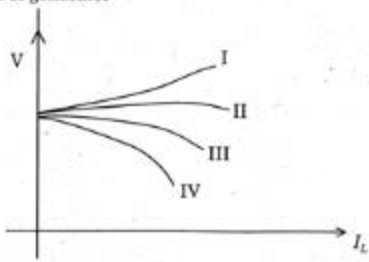
(A) 80 KJ (B) 80 MJ (C) 40 MJ (D) 20 MJ

19. The inertia constants of two groups of machines which do not swing together are $M_1$ and $M_2$. The equivalent inertia constant of the system is

(A) $M_1 + M_2$ (B) $M_1 - M_2$ if $M_1 > M_2$

(C) $\sqrt{M_1 M_2}$ (D) $\frac{M_1 M_2}{M_1 + M_2}$

20. The following figure shows load characteristics of dc generator. Match the characteristic with the type of generator




p – shunt
q – flat compound
r – over compound
s – differential

(A) p–I q–II r–III s–IV (B) p–II q–III r–IV s–I

(C) p–III q–II r–I s–IV (D) p–III q–IV r–I s–II

21. A 36-slot, 4-pole, dc machine has a simplex lap winding with two conductors per slot. The back pitch and front pitch adopted could be respectively

(A) 15, 13 (B) 19, 17 (C) 21, 19 (D) 23, 21

22. The alternating voltage (sinusoidal) across and current through a circuit are represented by $(a + jb)$ and $(c + jd)$ respectively. The power in watts is given by

(A) $ac - bd$ (B) $bc + ad$ (C) $ac + bd$ (D) $bc - ad$

23. The relation between the resonant frequency $f_0$ and the half-power frequencies $f_1$ and $f_2$ is

(A) $f_0 = \sqrt{f_1 f_2}$ (B) $f_0 = \frac{f_1 + f_2}{2}$ (C) $f_0 = f_1 f_2$ (D) $f_0^2 = f_1^2 + f_2^2$

24. In a balanced star network the measured resistance between any two terminals is $6\Omega$. The resistance between any two terminals of the equivalent delta network is

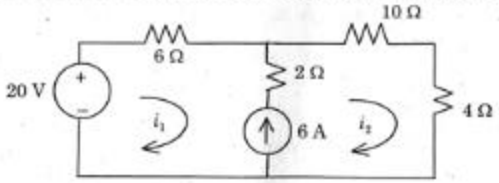
(A) $18\Omega$ (B) $6\Omega$ (C) $4.5\Omega$ (D) $9\Omega$

25. Kirchhoff's current law is based on the law of

(A) conservation of energy (B) conservation of charge

(C) conservation of momentum (D) conservation of mass

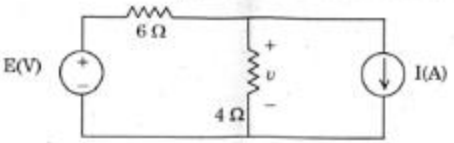
26. In the circuit shown which of the following statements is NOT correct?




(A) The circuit has a supermesh (B) $i_2 = i_1 + 6$

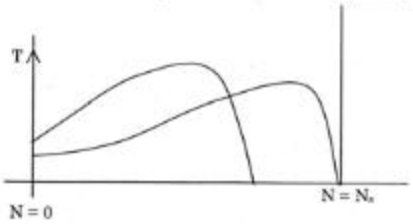
(C) $-20 + 6i_1 + 14i_2 = 0$ (D) $-20 + 6i_1 + 2(i_1 - i_2) = 0$

27. In the circuit shown. The voltage across $4\Omega$ resistance $v$ can be expressed as




(A) 0.4 E – 0.6 I (B) 0.6 E – 0.4 I (C) 0.4 E – 2.4 I (D) 0.4 E + 2.4 I

28. The following speed-torque characteristics are obtained for a 3-phase induction motor. Pick up the correct method of speed control from the options. (output constant)




(A) $\frac{V}{f}$ control (B) $\frac{E}{f}$ control

(C) pole changing with $f$ constant (D) stator voltage control, $f$ constant

29. The name plate of a 3-phase induction motor reads as

V = 400 V hp = 5 f = 50 Hz

I = 15 A Con – Δ N = 540 rpm

The number of poles for which stator winding is wound

(A) 10 (B) 12 (C) 14 (D) 16

30. The rotor impedance of a slip ring induction motor is $(0.1 + j0.6)\Omega$/ph. The resistance/ph to be inserted into rotor to get maximum torque at starting should be

(A) 0.1 Ω (B) 0.3 Ω (C) 0.4 Ω (D) 0.5 Ω

31. Given the following phasor diagram of salient pole synchronous machine, pick up the correct mode of operation


(A) generator, lagging pf (B) generator, upf

(C) motor, with leading pf (D) motor, with upf

32. The transfer function of a system is

$$\frac{1}{(s+1)(s+2)}$$

The impulse response of the system is

(A) $e^{-2t} - e^{-t}$ (B) $e^{-2t} + e^{-t}$ (C) $e^{-t} + e^{-2t}$ (D) $e^{-t} - e^{-2t}$

33. In a thermal power plant, ash is collected in

(A) mills (B) hoppers (C) bunkers (D) boiler

34. The average life of neutrons after they decay is

(A) 1 sec (B) 10 sec (C) 100 sec (D) 1000 sec

35. The operating time of instantaneous relay is

(A) 0.001 sec (B) 0.01 sec (C) 0.1 sec (D) 1 sec

36. For a round wire, the approximate value of fusing current is given by

(A) $K\sqrt{d^3}$ (B) $\sqrt{Kd^3}$ (C) $\frac{1}{K}\sqrt{d^3}$ (D) $\sqrt{d^3}$

37. Stringing chart is useful for

(A) the design of tower (B) the design of insulator string

(C) finding the sag in the conductor (D) finding the distance between the towers

38. The self GMD method is used to evaluate

(A) inductance (B) capacitance

(C) inductance and capacitance (D) resistance

39. The velocity of travelling wave through a cable of relative permitivity 36 is

(A) $3 \times 10^8$ m/sec (B) $2 \times 10^8$ m/sec (C) $0.5 \times 10^8$ m/sec (D) $10^8$ m/sec

40. The coefficient of reflection for current wave is

(A) 1 (B) 2 (C) –1 (D) 0

41. A relay has a rating of 5 A, 2.2 sec IDMT and a relay setting of 125% TMS = 0.6. It is connected to a supply circuit through a C.T. 400/5 ratio. The fault current is 4000 A. The operating current of the relay is

(A) 6.25 A (B) 5 A (C) 8 A (D) 2.2 A

42. A differential amplifier has a differential gain of 20,000, CMRR : 80 dB. The common mode gain is given by

(A) 1 (B) 1/2 (C) 2 (D) 250

43. An amplifier has input power of 2 microwatts. The power gain of the amplifier is 60 dB. The output power will be

(A) 2 milliwatts (B) 6 microwatts (C) 2 watts (D) 120 microwatts

44. The voltage gains of the amplifier with and without feedback are 20 and 100 respectively. The percentage of negative feedback would be

(A) 40% (B) 80% (C) 4% (D) 8%

45. For OPAMP in differential configuration, open loop gain is 100000, and differential input voltage is 2 $\mu$V. Power supply for OPAMP is $\pm 12$ V. Then output voltage will be

(A) + 12 V (B) −12 V (C) 0 V (D) 2 $\mu$V

46. A 3-stage ripple counter has Flipflop with propagation delay of 25 nsec and pulse width of strobe input 10 nsec. Then the maximum operating frequency at which counter operates reliably is

(A) 16.67 MHz (B) 17.6 MHz (C) 12.67 MHz (D) 11.76 MHz

47. The percent resolution of an 8-bit D/A converter is

(A) 0.392 (B) 1/256 (C) 1/255 (D) (A) and (B) both

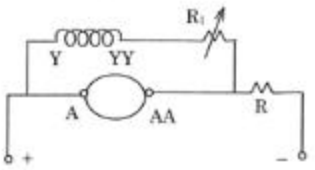
48. The diode used in a clippling circuit has $R_f = 25\,\Omega$ and $R_r = 1\,M\Omega$. The external resistor $R$ is

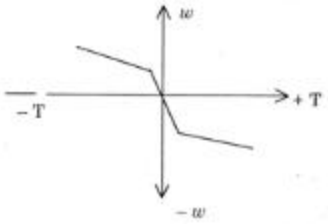
(A) 50 K$\Omega$ (B) 5 K$\Omega$ (C) 1/25 M$\Omega$ (D) 25 M$\Omega$

49. Which circuit is used as amplitude comparator?

(A) Bistable (B) Monostable (C) Astable (D) Schmitt trigger

**50.** A dc series motor is connected as given below




The per unit values of R and $R_1$ to get the above speed torque characteristic would be

(A) 0, 0.5 (B) 0.5, 0.5 (C) 0.5, ∞ (D) ∞, 0.5

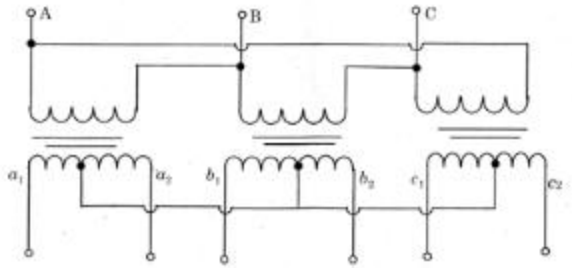
**51.** A 200 V dc shunt motor is running at 1000 rpm and drawing a current of 10 A. Its armature winding resistance is 2Ω. It is braked by plugging. The resistance to be connected in series with armature to restrict armature current to 10 A, is

(A) 32 Ω (B) 36 Ω (C) 38 Ω (D) 40 Ω

**52.** A transformer has maximum efficiency at $\frac{3}{4}$ th of full load. The ratio of its iron loss $(p_i)$ and full load copper loss $(p_c)$, is

(A) $\frac{4}{3}$ (B) $\frac{16}{9}$ (C) $\frac{9}{16}$ (D) $\frac{3}{4}$

**53.** The following connection of three single phase transformer bank results in




(A) 3-phase to 2-phase conversion (B) 3-phase to 3-phase

(C) 2-phase to 3-phase conversion (D) 3-phase to 6-phase conversion

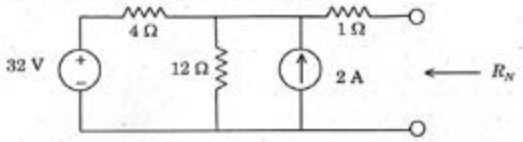
54. The initial value of $f(t)$, with transform $F(s)=\frac{s+1}{(s+2)(s+3)}$ is

(A) 0 (B) 1 (C) $\infty$ (D) $\frac{1}{6}$

55. The two-port parameter $h_{21}$ is called

(A) open-circuit output admittance (B) short-circuit input impedance
(C) open-circuit reverse voltage gain (D) short-circuit forward current gain

56. The Norton's resistance of the circuit shown is




(A) 17Ω (B) 3Ω (C) 4Ω (D) 0.9Ω

57. The impedance of a two-element series circuit is represented by $(20-j10)\Omega$ at a certain frequency. If the frequency is doubled, the new value of impedance is

(A) $(20-j5)\Omega$ (B) $(40-j20)\Omega$ (C) $(10-j10)\Omega$ (D) $(20-j20)\Omega$

58. A unity feedback control system has forward-path transfer function $G(s)=\frac{K}{s(s+2)}$. If the design specification is that the steady-state error due to a unit ramp input is 0.05, the value of $K$ allowed is

(A) 20 (B) 40 (C) 10 (D) 80

59. The transfer function of a system has the form $G(s)=\frac{200(s+2)}{s(s^2+10s+100)}$. At very high frequencies the Bode gain curve has a slope of

(A) –6 dB/octave (B) –12 dB/octave (C) 6 dB/octave (D) 12 dB/octave

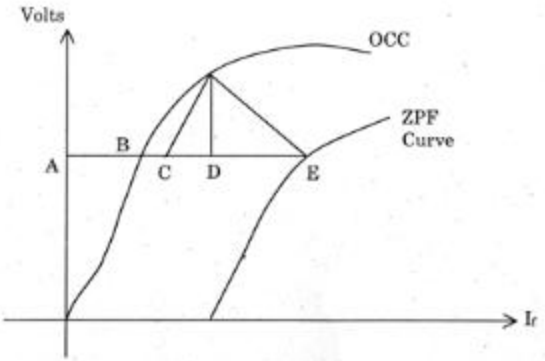
60. A unity feed-back system has open-loop transfer function

$$GH(s)=\frac{K}{s(s+4)(s+16)}$$

It's root locus plot intersects the $j\omega$ axis at

(A) ±j 2 (B) ±j 4
(C) ±j 8 (D) does not intersect the $j\omega$ axis

**61.** The potier triangle of synchronous generator is as shown in figure




The segment DE refers to field current to compensate

(A) leakage reactance drop
(B) armature reaction
(C) saturation
(D) resistance drop

**62.** In slip test on salient pole synchronous machine, the stator mmf alignment for maximum/minimum current drawn from mains is

| | Maximum current ↓ | Minimum current ↓ |
|---|---|---|
| (A) | along 45° to q-axis | along d-axis |
| (B) | along q-axis | along 45° to d-axis |
| (C) | along d-axis | along q-axis |
| (D) | along q-axis | along d-axis |

**63.** Two synchronous generators $G_1, G_2$ are operating in parallel and are equally sharing KVAR (Lag) component of load. To shift part of KVAR from $G_2$ to $G_1$, while keeping terminal voltage fixed, the following action must be done

(A) Raise $If_1$ and lower $If_2$
(B) Lower $If_1$ and raise $If_2$
(C) Lower $If_1$ or raise $If_2$
(D) Raise $If_1$ or lower $If_2$

64. Load flow studies involve solving simultaneous

(A) linear algebraic equations (B) non linear algebraic equations

(C) linear differential equations (D) non linear differential equations

65. A 12 bus power system has 3 voltage controlled buses. The dimensions of the Jacobian matrix will be

(A) $21 \times 21$ (B) $21 \times 19$ (C) $19 \times 19$ (D) $19 \times 21$

66. The cost function of a 50 MW generator is given by ($p_i$ is the generator loading)

$F(p_i) = 225 + 53p_i + 0.02p_i^2$

When 100% loading is applied, the Incremental Fuel Cost (IFC) will be

(A) Rs. 55 per MWh (B) Rs. 55 per MW

(C) Rs. 33 per MWh (D) Rs. 33 per MW

67. The ABCD constants of a 3 phase transmission line are

$A = D = 0.8\angle 1^\circ$

$B = 170\angle 85^\circ\ \Omega$

$C = 0.002\angle 90.4^\circ$ mho

The sending end voltage is 400 KV. The receiving end voltage under no load condition is

(A) 400 KV (B) 500 KV (C) 320 KV (D) 417 KV

68. Bundled conductors are used for EHV transmission lines primarily for reducing the

(A) Surge impedance of the line (B) $I^2R$ losses

(C) Voltage drop across the line (D) Corona loss

69. If all the sequence voltages at the fault point in a power system are equal, then the fault is

(A) three phase fault (B) line to ground fault

(C) line to line fault (D) double line to ground fault

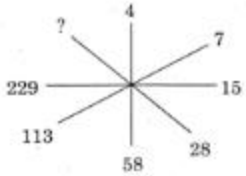
70. Severe over voltages are produced during arcing faults in a power system with the neutral

(A) isolated (B) solidly earthed

(C) earthed through a low resistance (D) earthed through an inductive coil

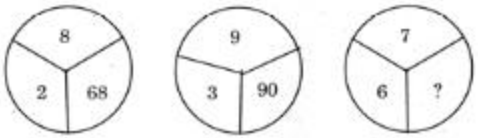
## SECTION (B) : APTITUDE

71. Identify the number which should come in the place of question mark?




(A) 452 (B) 454 (C) 446 (D) 432

72. Identify the number which should come in the place of question mark?




(A) 64 (B) 92 (C) 85 (D) 76

73. X introduces Y saying, "He is the husband of the grand daughter of the father of my father". How is Y related to X?

(A) brother (B) uncle (C) co-brother (D) brother-in-law

74. Ravi is 7 ranks ahead of Sumit in a class of 39. If Sumit's rank is seventeenth from the last, what is Ravi's rank from the start?

(A) 11 (B) 15 (C) 13 (D) 9

75. In a certain code, 'bi nie pie' means "some good jokes", 'nie hat lik' means "some real stories; ' pie lik tol' means "many good stories". Which word in the code means 'jokes'?

(A) nie (B) pie (C) lik (D) bi

76. There are five bus stops, A, B, C, D, E at equal intervals. C is not the middle stop. A and E are not terminal stops. C comes twice as many stops before D in upward journey as B comes after A. D is the first stop in downward journey. The correct sequence of stops in downward journey is

(A) ABDCE (B) CDAEB (C) DACEB (D) DEBAC

77. Identify the odd one

(A) heart (B) liver (C) nose (D) kidneys

78. 18, 10, 6, 4, 3, ?

(A) 8 (B) 4 (C) 3.5 (D) 2.5

79. Which makes the best comparison?

TOMATO : MTOOTA : : 123412 : ?

(A) 312214 (B) 123456 (C) 321124 (D) 213314

80. My brother is standing 40 m South-West of my sister. I am standing 40 m South-East of my brother. I am in which direction of my sister?

(A) South (B) West (C) East (D) North-East

81. Find the next letters in series : BCZ, DEY, FGX, HIW, ————————

(A) JKL (B) JKV (C) JKU (D) JKT

82. Find related word

Conscience : Wrong : : Police : ————————

(A) thief (B) law (C) discipline (D) crime

83. A shopkeeper sells one transistor for Rs. 840 at a gain of 20% and another for Rs. 960 at a loss of 4%. His total gain or loss percent is

(A) $5\frac{15}{17}$% loss (B) $5\frac{15}{17}$% gain (C) $6\frac{2}{3}$% gain (D) $6\frac{2}{3}$% loss

84. A boatman goes 2 km against the current of the stream in 1 hour and goes 1 km along the current in 10 minutes. How long will it take to go 5 km in stationary water?

(A) 40 minutes (B) 1 hour (C) 1 hr 15 min (D) 1 hr 30 min

85. In how many ways can the letters of the word LEADER can be arranged?

(A) 72 (B) 144 (C) 360 (D) 720

86. One pipe can fill a tank three times as fast as another pipe. If together, the two pipes can fill the tank in 36 minutes, then the slower pipe alone will be able to fill the tank in

(A) 81 min (B) 144 min (C) 108 min (D) 192 min

87. If $\log 27 = 1.431$, then the value of $\log 9$ is

(A) 0.934 (B) 0.954 (C) 0.945 (D) 0.958

**88.** $H_1(x) = 1 - x,\ 0 < x < 1$
$= 1,\quad x \geq 1$
$= 0,\quad$ otherwise

$H_2(x) = -H_1(x)$ for all $x$

$H_3(x) = H_2(-x)$ for all $x$

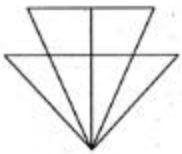
$H_4(x) = -H_3(x)$ for all $x$

How many of the following products are necessarily zero for every value of '$x$'?

$H_1(x) * H_3(x);\ H_3(x) * H_2(x);\ H_1(x) * H_2(x)$

(A) 0 (B) 1 (C) 2 (D) 3

**89.** In the following diagram, how many triangles are there?



(A) 12 (B) 13 (C) 11 (D) 10

**90.** The length of the bridge, which a train 130 m long and traveling at 45 km/hr can cross in 30 sec is

(A) 200 m (B) 225 m (C) 245 m (D) 250 m

**91.** If 'PAPER' is 11.20, 'PENCIL' is 9.83, what will be the PEN?

(A) 12.80 (B) 11.60 (C) 1.66 (D) 13.8

**92.** What is the sum of all the numbers less than 100 that can be written as the sum of 9 consecutive positive integers?

(A) 612 (B) 630 (C) 702 (D) 504

**93.** An observer 1.6 m tall is $20\sqrt{3}$ away from a tower. The angle of elevation from his eye to the top of the tower is 30°. The height of the tower is

(A) 21.6 m (B) 23.2 m (C) 24.72 m (D) 21.4 m

**94.** The sum of a three digit number and the number formed by reversing its digits is 989. The sum of its digits 13. Find the middle digit

(A) 9 (B) 6 (C) 4 (D) 2

**95.** ABC is a three digit number. The sum of its digits is 9. If each of BA and BC are two digit numbers such that BA = BC – 3. How many values C can take?

(A) 16 (B) 6 (C) 26 (D) 36

**96.** A test consists of 50 questions. Each correct answer fetches 1 mark and for each wrong answer 1/2 mark is deducted. A candidate who wrote this test attempted all the questions and scored 41 marks. Find the number of questions he answered correctly?

(A) 46 (B) 42 (C) 44 (D) 48

**97.** When the numerator of a fraction is increased by 7 and denominator is increased by 13, the resulting number is equivalent to the obtained when the numerator is decreased by 2 and denominator is decreased by 11. The sum of numerator and denominator is 24. Find the fraction

(A) $\frac{1}{23}$ (B) $\frac{7}{17}$ (C) $\frac{11}{13}$ (D) $\frac{5}{19}$

**98.** Two straight lines can divide a circular disk into a maximum of four parts. Likewise, into how many maximum parts can four straight lines divide a circular disk?

(A) 11 (B) 21 (C) 31 (D) 41

**99.** If $(ABCD)_a = D*a\text{^}0 + C*a\text{^}1 + B*a\text{^}2 + A*a\text{^}3$.
$(8448)_9 / (2112)_9 = (y)_5$, then $y$ is

(A) 011 (B) 101 (C) 110 (D) 111

**100.** Five persons namely, Yasin, Arafat, Rasheed, Ali and Rehman are to be seated in five out of the six seats numbered from 1 to 6. The following table provides information about the serial numbers of the seats (given in the table under their name) on which each of the mentioned friends can possibly sit.

| Names | Yasir | Arafat | Rasheed | Ali | Rehman |
|---|---|---|---|---|---|
| Seat No. | 1 | 2 or 3 | 2, 3 or 4 | 4 or 5 | 5 or 6 |

If one of the seats numbered 2 or 4 is unoccupied, then the number of different ways five mentioned persons can be seated is

(A) 1 (B) 2
(C) 3 (D) 4