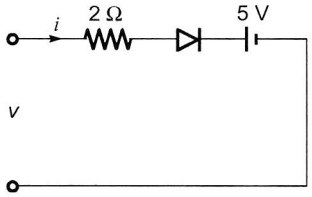
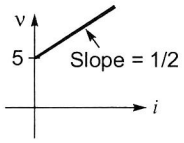
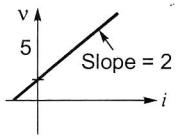
Section-A (Technical)

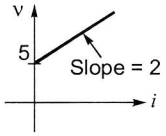
1. The figure shows a network in which the diode is an ideal one.

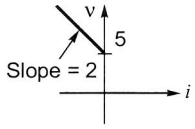


the terminal v-i characteristics of the network is given by

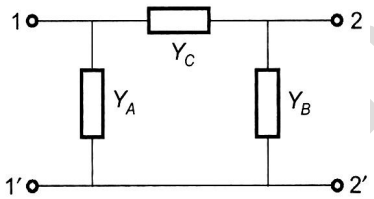
(a) 

(b) 

(c) √ 

(d) 

2. For the two-port network as shown below, Y_{12} is equal to.



(A) $Y_A + Y_B$ (B) $Y_C + \left(\frac{Y_A Y_B}{Y_A + Y_B}\right)$

(C) $-Y_C$ (D) Y_C

3. The driving point impedance function, $Z(s) = \frac{s^2 + 2s + 2}{s^2 + s + 1}$, may be realized by.

(A) R-C network
(B) L-C network
(C) L-C network
(D) None of the above networks

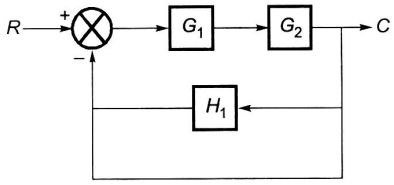
4. When reading is taken at half scale in the instrument, the error is

(A) exactly equal to half to full-scale error
(B) equal to full-scale error
(C) less than full-scale error
(D) more than full-scale error

5. Which one of the following is used for the measurement of 3-phase power factor?

(A) Power factor meter
(B) Crossed-coil power factor meter
(C) Phase-angle watt hour meter
(D) Polarised-vane power factor meter

6. The resulting equivalent transfer function of the system shown below is



(A) $\frac{G_1G_2}{1 + G_2G_2 + G_1G_2H_1}$ (B) $\frac{G_1G_2}{1 + G_2G_2 + G_1H_1}$

(C) $\frac{G_1G_2}{1 + H_1G_1G_2}$ (D) $\frac{G_1G_2}{1 + G_1G_2 + H_1}$

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

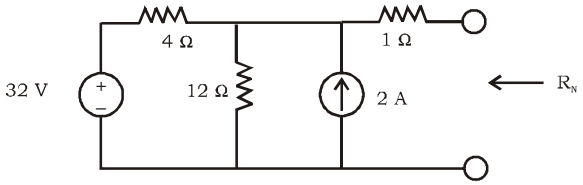
(A) 0 **(B) 1**

(C) ∞ (D) $\frac{1}{6}$

8. 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

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



(A) 17 Ω (B) 3 Ω

(C) 4 Ω (D) 0.9 Ω

10. 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) $(20 - j20)\Omega$

11. 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

12. 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

13. 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 jw axis at

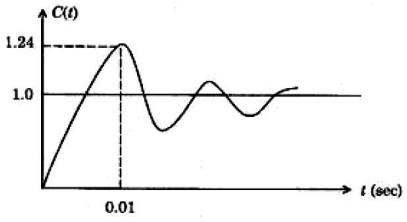
(A) $\pm$ j 2

(B) $\pm$ j 4

(C) $\pm$ j 8

(D) does not intersect the jw axis

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



(A) 1 (B) 2

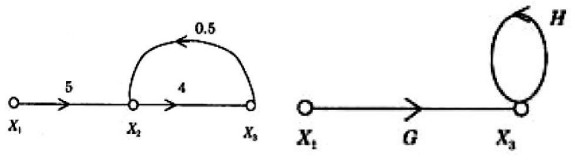
(C) 0.414 (D) zero

15. An example of a bounded signal is

(A) e^{-2t} (B) e^{2t}

(C) t (D) $e^{t}\sin t$

16. 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**

17. 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

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

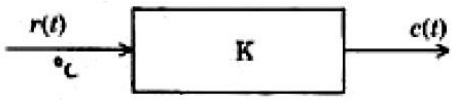
(A) principle of superposition

(B) principle of homogeneity

(C) both (A) and (B) above

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

19. 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

20. 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) $e^{-t} - e^{2t}$**

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

(A) mills

(B) hoppers

(C) condenser

(D) boiler

22. The average life of neutrons after they decay is
(A) 1 sec **(B) 10 sec**
(C) 100 sec (D) 1000 sec

23. The operating time of instantaneous relay is
(A) 0.001 sec (B) 0.01 sec
(C) 0.1 sec (D) 1 sec

24. For a round wire, the approximate value of fusing current is given by
(A) $K\sqrt{d^3}$ (B) $K\sqrt{d^2}$
(C) $\frac{1}{K}\sqrt{d^3}$ (D) $\sqrt{d^3}$

25. 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

26. The self GMD method is used to evaluate
(A) inductance
(B) capacitance
(C) inductance and capacitance
(D) resistance

27. The velocity of travelling wave through a cable of relative permitivity 36 is
(A) 3×10^8 m/sec
(B) 2×10^8 m/sec
(C) 0.5×10^8 m/sec
(D) 10^8 m/sec

28. The coefficient of reflection for current wave is
(A) 5 (B) 2
(C) –1 (D) 0

29. A relay has a rating of 5 A, 2.2 sec IDMT and a relay settign 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

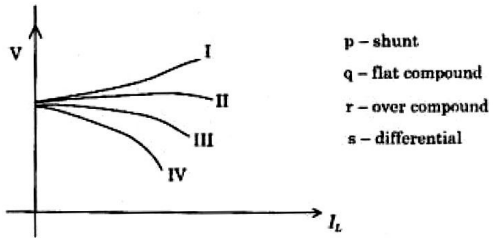
30. Auto reclosing is used in case of
(A) lightning arrester
(B) bulk oil C.B.
(C) air blast C.B.
(D) minimum oil C.B.

31. 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.

32. A 50 Hz, 4 pole turbolaternator 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

33. 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)** $\frac{M_1 M_2}{M_1 + M_2}$

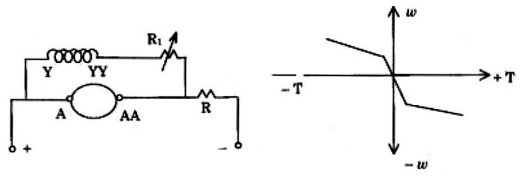
34. The following figure shows load characteristics of dc generator. Match the characteristic with the type of generator



(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

35. 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

36. 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

37. 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

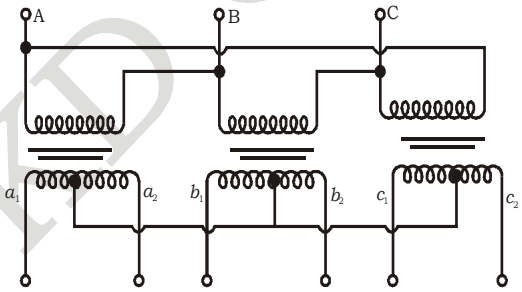
(D) 40 Ω

38. 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) $\frac{3}{4}$

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



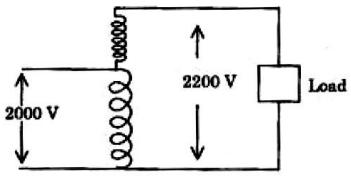
(A) 3-phase to 2-phase conversion

(B) 3-phase to 3-phase

(C) 2-phase to 3-phase conversion

(D) 3-phase to 6-phase conversion

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



(A) 125 **(B) 275**

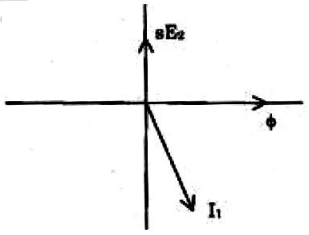
(C) 375 (D) 175

41. 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

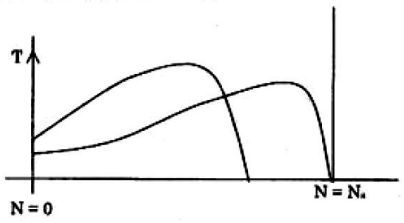
(C) 0.62 (D) 0.36

42. 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

43. 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

44. 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

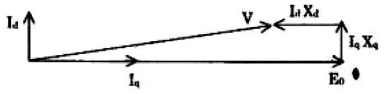
(C) 14 (D) 16

45. The rotor impedance of a slip ring induction motor is (0.1 + j0.6)Ω/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**

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



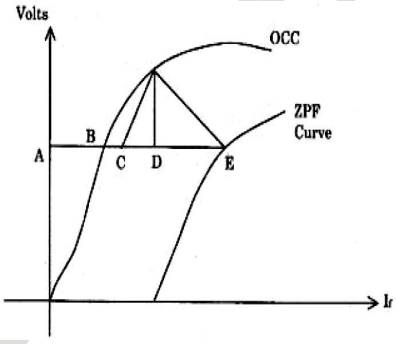
(A) generator, lagging pf

(B) generator, upf

(C) motor, with leading pf

(D) motor, with upf

47. 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

48. 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 1-axis	along d-axis
(B)	along d-axis	along 45° to d-axis
(C)	along d-axis	along q-axis
(D)	**along q-axis**	**along d-axis**

49. 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

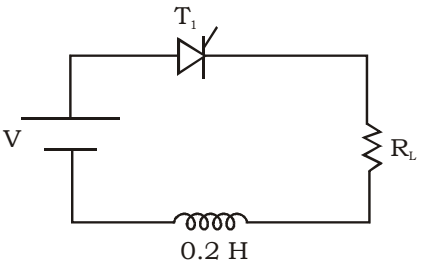
(A) Raise If_1 and lower If_2

(B) Lower If_1 and raise If_2

(C) Lower If_1 or raise If_2

(D) Raise If_1 or lower If_2

50.



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

(A) 2 μ sec **(B) 1 μ sec**

(C) 0.5 μ sec (D) 1.5 μ sec

51. A single phase fully controlled rectifier has an average output voltage of 200 V when a = 0, Its output voltage when a = 30° is approximately

(A) 200 V

(B) 160 V

(C) 173 V

(D) 183 V

52. A 200 V dc-dc converter is turned ON for 30 μ sec and turned off for 10 μ sec. The output voltage will be

(A) 200 V **(B) 150 V**

(C) 175 V (D) 120 V

53. 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°**

54. 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 m Ω
(C) 13 Ω **(D) 26 Ω**

55. 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

56. 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

57. 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

58. 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%

59. For OPAMP in differential configuration, open loop gain is 100000, and differential input voltage is 2 uV. Power supply for OPAMP is + 12 V. Then output voltage will be
(A) + 12 V **(B) –12 V**
(C) 0 V **(D) 2 μ V**

60. 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**

61. 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**

62. A diode used in a clippling circuit has R_f = 25Ω and R_r = 1MΩ. The external resistor R is
(A) 50 KΩ **(B) 5 KΩ**
(C) 1/25 MΩ (D) 25 MΩ

63. Which circuit is used as amplitude comparator?
(A) Bistable (B) Monostable
(C) Astable **(D) Schmitt trigger**

64. The percentage resistance and reactance of a transformer are 2% and 4% respectively. The approximate regulation on full load at 0.8 pf lag is
(A) 12% (B) 8%
(C) 6% **(D) 4%**

65. Stepper motors are mostly used for
(A) High power requirements
(B) Control system applications
(C) Very high speed of operation
(D) Very low speed of operation

66. Control rods used in nuclear reactors are made of
(A) Zirconium **(B) boron**
(C) beryllium (D) lead

67. Equal area criterion gives the information regarding
(A) Stability region
(B) Absolute stability
(C) Relative stability
(D) Swing curves

68. The insulation of modern EHV lines is designed based on
(A) The lighting voltage
(B) Corona
(C) Radio interference
(D) Switching voltage

69. Load flow studies involve solving simultaneous
(A) Linear algebraic equations
(B) Non-linear algebraic equations
(C) Linear differential equations
(D) Non - linear differential equations

70. A voltage source inverter is used when source and load inductances are respectively
(A) Small and large (B) Large and small
(C) Large and large (D) small and small

SECTION-B (APTITUDE)

71. Identify the odd one
(A) heart (B) liver
(C) nose (D) kidneys

72. 18, 10, 6, 4, 3, ?
(A) 8 (B) 4
(C) 3.5 **(D) 2.5**

73. Which makes the best comparison?
TOMATO : MTOOTA :: 123412 : ?
(A) 312214 (B) 123456
(C) 321124 (D) 213314

74. 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

75. Find the next letters in series : BCZ, DEY, FGX, HIW, _____
(A) JKL **(B) JKV**
(C) JKU (D) JKT

76. Find related word
Conscience : Wrong : : Police : _____
(A) thief (B) law
(C) discipline **(D) crime**

77. 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*

78. 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

79. In how many ways can the letters of the word LEADER can be arranged?
(A) 72 (B) 144
(C) 360 (D) 720

80. 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

81. If log 27 = 1.431, then the value of log 9 is
(A) 0.934 **(B) 0.954**
(C) 0.945 (D) 0.958

82. 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

83. 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

84. 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

85. 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

86. 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)** $\frac{5}{19}$

87. 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

88. If $(ABCD)_a$ = D*a^0 + C*a^1+B*a^2+A*a^3, $(8448)_9/(2112)_9 = (y)_3$, then y is
(A) 011 (B) 101
(C) 110 (D) 111

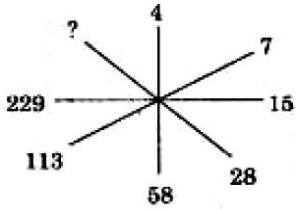
89. Five persons namely, Yasin, Arafat, Rasheed, Ali and Rehman are to be scated in five out of the six seats numbered from 1 to 6. The following table provides information about the serial numbers of the seats (given in the table under their name) on which each of the mentioned friends can possibly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

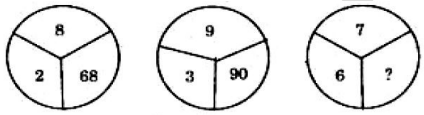
(A) 1 (B) 2
(C) 3 (D) 4

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



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

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



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

92. 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**

93. 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

94. In a certain code, 'bi nie pie' means "some good jokes", nie bat 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) hi**

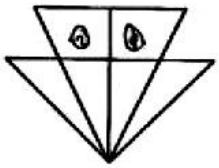
95. There are five bus stops, A, B, C, D, E at equal intervals. C is not the middle stop. A and E are not terminal stops. C comes twice as many stops before D in upward journey as B comes after A. D is the first stop in downward journey. The correct sequence of stops in downward journey is

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

96. $H_1(x) = 1 - x$, $0 < x < 1$
$= 1$, $x \geq 1$
$= 0$, 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

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



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

98. 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

99. 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

100. 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**