

Sr. No

[SET-V]
Ph.D. Programme (Odd Semester)
ELECTRICAL & INSTRUMENTATION ENGINEERING

Marks: 100

Time: 2 hours

| | |
|-----------------|--------------------|
| Roll No.: _____ | Date: _____ |
| Time: _____ | Centre Name: _____ |

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|--|---|
| 1. | Please do not open (Break the seal) of the question booklet before time |
| 2. | An OMR answer sheet is being provided separately along with this question booklet. Please fill up all relevant entries like Roll number, Centre code, Paper Number etc. in the spaces provided on the OMR answer sheet and put your signature in the box provided for this purpose. |
| 3. | There are 100 questions in this booklet. Against each question four alternative choices (A), (B), (C) and (D) are given, out of which only one is correct. Indicate your choice of answer by Darkening the suitable circle with Black/Blue Ball Pen in the OMR answer sheet supplied to you separately. |
| 4. | Each question carries one mark. There will be 1/4th negative marking. |
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| 8. | Do not talk to each other. Do not borrow anything from other candidates. |
| 9. | Use of CALCULATOR (except programmable calculator) is allowed. |
| 10. | Any body found involved in malpractices, will be disqualified from appearing in the entrance test. |
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NOTE:

- (i) Attempt all questions. Each question carries one mark. There will be $1/4^{\text{th}}$ negative marking.
- (ii) **There are 100 questions in this booklet.** Against each question four alternative choices (A), (B), (C) and (D) are given, out of which only one is correct. Indicate your choice of answer by Darkening the suitable circle with **Black/Blue Ball Pen** in the OMR answer sheet supplied to you separately.

1. **The maximum efficiency of a half-wave rectifier circuit can be**
 (A) 37.2%
 (B) 40.6%
 (C) 53.9%
 (D) 81.2%
2. **An over-current relay of current 5A and setting 150% is connected to the secondary of CT while CT ratio is 300:5. The current in the lines for which relay picks up is**
 (A) 300 A
 (B) 450 A
 (C) 150 A
 (D) 200 A
3. **A 100 mA meter has accuracy of $\pm 2\%$. Its accuracy while reading 50 mA will be**
 (A) $\pm 1\%$
 (B) $\pm 2\%$
 (C) $\pm 4\%$
 (D) $\pm 20\%$
4. **A 4-digit DVM(digital voltmeter) with a 100-mV lowest full scale range would have a sensitivity of how much value while resolution of this DVM is 0.0001**
 (A) 0.1 mV
 (B) 0.01 mV
 (C) 1.0 mV
 (D) 10 mV
5. **In a 4-bit weighted resistor D/A converter, the resistor value corresponding to LSB is 32 k Ω . The resistor value corresponding to MSB will be**
 (A) 32 Ω
 (B) 16 Ω
 (C) 8 Ω
 (D) 4 Ω
6. **For a two port linear passive bilateral network is**
 (A) AD=BC
 (B) AD-BC=0
 (C) AD-BC=1
 (D) AB-BC=1
7. **A distribution station has a peak load of 3000 kW and total annual energy of 10^7 kWh. The peak power loss is 220 kW. The loss factor is:**
 (A) 0.215
 (B) 0.285
 (C) 0.325
 (D) 0.356
8. **If commutation angle of a diode rectifier (due to source inductance effect) is μ , then inductance voltage regulations will be**
 (A) $\frac{1 + \cos \mu}{2}$
 (B) $\frac{1 - \cos \mu}{2}$
 (C) $1 + \frac{\cos \mu}{2}$
 (D) $1 - \frac{\cos \mu}{2}$
9. **The load frequency response in a system**
 (A) Does consider the reactive power flow
 (B) Does not consider the reactive power flow
 (C) Does not consider the real power flow
 (D) none of the above

10. For a synchronous phase modifier, the load angle is
 (A) 0°
 (B) 25°
 (C) 30°
 (D) 50°
11. A pilot exciter is:
 (A) A level compound small DC generator
 (B) A small servo-type synchronous generator
 (C) A main synchronous generator
 (D) A main exciter
12. An electro-dynamometer type instruments find major use as
 (A) Standard instruments only
 (B) Transfer instrument only
 (C) Both as standard and transfer instruments
 (D) A indicator type of instrument
13. The power in a 3-phase circuit is measured with the help of 2-wattmeters. The readings of one wattmeter are positive and that of other negative. The magnitude of readings is different. It can be concluded that the power factor of the circuit is
 (A) Unity
 (B) Zero (Lagging)
 (C) 0.5 (lagging)
 (D) Less than 0.5 (lagging)
14. In a single phase induction type energy meter, the lag adjustment is done
 (A) To make current coil flux to lag behind the applied voltage
 (B) To make pressure coil flux to lag behind the applied voltage
 (C) To make pressure coil flux in phase with applied voltage
 (D) None of the above
15. A phase sequence indicator rotates clockwise for phase sequence of RYB. If phase sequence is changed to BRY, It will rotate
 (A) Anticlockwise
 (B) Clockwise
 (C) Clockwise or anticlockwise
 (D) None of the above
16. Frequency can be measured by using
 (A) Maxwell's bridge
 (B) Schering bridge
 (C) Heaviside Campbell bridge
 (D) Wien's bridge
17. The electric strength of new insulating oil should have a minimum strength (r.m.s) of
 (A) 30 kV/mm
 (B) 3kV/mm
 (C) 50 kV/mm
 (D) 5 kV/mm
18. Bundled conductors are used in transmission lines, the effective capacitance and inductance will respectively
 (A) Decrease and increases
 (B) Increases and Decrease
 (C) remain same and increase
 (D) decrease and remain same
19. The efficiency of a transformer at full load 0.8 p.f lagging is 90%. Its efficiency at full load 0.8 p.f leading will be
 (A) Less than 90%
 (B) More than 90%
 (C) 90%
 (D) None of these
20. A series R-L circuit is suddenly connected to d.c. voltage source of V volts. The current in this series circuit, just after the switch is closed, is equal to
 (A) Zero
 (B) V/L
 (C) V/C
 (D) $V.L/C$
21. The per unit impedance of a circuit element is 0.3. If the base kV and base MV are halved, then the new value of per unit impedance of the circuit will be
 (A) 0.30
 (B) 0.60
 (C) 0.0030
 (D) 0.0060

22. At slack bus, which one of the following combinations of variables is specified?
 (A) $|V|, \delta$
 (B) P, Q
 (C) P, $|V|$
 (D) Q, $|V|$
23. In load flow studies, PV bus is treated as PQ bus when
 (A) Phase angle become high
 (B) Reactive power goes beyond limit
 (C) Voltage at the bus become high
 (D) Any of the above
24. If the penalty factor of a plant is unity, its incremental transmission loss is
 (A) 1.0
 (B) -1.0
 (C) Zero
 (D) None of the above
25. The insulation resistance of a single core cable is $160 \text{ M}\Omega/\text{km}$. The insulation resistance for 4 km length is
 (A) $80 \text{ M}\Omega$
 (B) $40 \text{ M}\Omega$
 (C) $120 \text{ M}\Omega$
 (D) $320 \text{ M}\Omega$
26. The load current and flux of a d.c. motor are kept constant, if the supply voltage is increased by 20%, its speed will
 (A) will remain unchanged
 (B) Increase by 20%
 (C) Decrease by 20%
 (D) Depend upon armature reaction
27. For d.c. shunt motor, speed control by variation of field flux is best suited for
 (A) Constant power drive
 (B) Variable power drive
 (C) Constant torque drive
 (D) Variable torque drive
28. If the field circuit of d.c motor running at rated speed gets open circuited, then immediately after this the speed of motor would tend to
 (A) Decrease
 (B) Increase
 (C) Remain unchanged
 (D) Oscillate around the rated speed.
29. If the rated voltage from power lines is applied to the primary of a single phase transformer which is operated on no-load then
 (A) Both input voltage and current sinusoidal
 (B) Input voltage is sinusoidal and input current is non-sinusoidal
 (C) Both input voltage and current are non-sinusoidal
 (D) Input voltage is non-sinusoidal and input current is sinusoidal
30. Approximate value of the efficiency of a three-phase induction motor running at slip s is given by
 (A) $\frac{1}{1+s}$
 (B) $\frac{s}{1+s}$
 (C) $\frac{1-s}{1+s}$
 (D) $\frac{s}{1+s}$
31. If normal frequency is 50 Hz, then setting of the under-frequency relay for the most important load could be
 (A) 49 Hz
 (B) 48.5 Hz
 (C) There is no grading for under-frequency relays
 (D) 47.5 Hz
32. The relay which is most sensitive to power swings is
 (A) Mho relay
 (B) Reactance relay
 (C) Impedance relay
 (D) All are equally affected
33. A coil of 150 degree pitch has third harmonic pitch factor as
 (A) $\cos 225^\circ$
 (B) $\sin 225^\circ$
 (C) $\cos 45^\circ$
 (D) $\sin 45^\circ$
34. Constant voltage source is
 (A) Active and bilateral
 (B) Passive and bilateral
 (C) Active and unilateral
 (D) Passive and unilateral

35. In a D.C. machine the armature m.m.f. is always directed along the
 (A) Polar axis
 (B) Brush axis
 (C) Interpolar axis
 (D) None of the above
36. The system described by the difference equation
 $y(n) - 2y(n-1) + y(n-2) = x(n) - x(n-1)$ has $y(n) = 0$ for $n < 0$
 If $x(n) = \delta(n)$, then $y(2)$ will be
 (A) 2
 (B) 1
 (C) Zero
 (D) -1
37. The Z-transform of signal is given by $\frac{z^{-1}(1-z^{-4})}{4(1-z^{-1})^2}$. Its final value is
 (A) $\frac{1}{4}$
 (B) 0
 (C) 1.0
 (D) ∞
38. If dimension of all the parts of a synchronous generator, and the number of field and armature turns are doubled, then generated voltage will change by a factor of
 (A) 1
 (B) 2
 (C) 8
 (D) 4
39. In a CRT, the focusing anode is located
 (A) Between pre-accelerating and accelerating anodes
 (B) After accelerating anode
 (C) Before pre- and accelerating anode
 (D) None of these
40. The first order control system, which is well designed, has a
 (A) small bandwidth
 (B) negative time constant
 (C) large negative transfer function pole
 (D) none of the above
41. A.C. servomotor is basically a
 (A) universal motor
 (B) single phase induction motor
 (C) two phase induction motor
 (D) three phase induction motor
42. In a single phase induction type energy meter, the lag adjustment is done
 (A) To make current coil flux to lag behind the applied voltage
 (B) To make pressure coil flux to lag behind the applied voltage
 (C) To make pressure coil flux in phase with applied voltage
 (D) None of the above
43. At the leading power factor, the voltage regulation of transformer is
 (A) Negative
 (B) Positive
 (C) Zero
 (D) Is independent of power factor
44. The no load voltage of a certain generator is 220 V, and the rated voltage is 200 V. Then Voltage regulation is
 (A) 1%
 (B) 9%
 (C) 10%
 (D) 9%
45. The short circuit ratio of synchronous machine is equal to
 (A) Per unit value of synchronous reactance adjusted to saturation at rated voltage.
 (B) The reciprocal of per unit value of synchronous reactance adjusted to saturation at rated voltage.
 (C) The reciprocal of per unit value of synchronous reactance
 (D) Is independent of synchronous reactance
46. For a three phase induction motor operating at full load slip, if slip is to be doubled for constant load torque, the voltage must be reduced by a factor of
 (A) $1/1.414$
 (B) $\frac{1}{2}$
 (C) $1/3$
 (D) $1/6$

47. The inverter is used to control the speed of three phase induction motor
- (A) By varying the frequency of supply
 - (B) By varying the voltage frequency
 - (C) By varying the resistance of stator winding
 - (D) By varying none of the above

48. If one of the transformers is withdrawn from delta/delta bank of 10 kVA rating each to form an open –delta connection, the rating of the bank will be
- (A) 20 kVA
 - (B) 17.31 kVA
 - (C) 25.67 kVA
 - (D) 27.74 kVA

49. For a pulse transformer, the material used for its core and the possible turn ratio from primary to secondary are respectively
- (A) Ferrite; 20:1
 - (B) Laminated iron; 1:1
 - (C) Ferrite; 1:1
 - (D) Powdered iron; 1:1

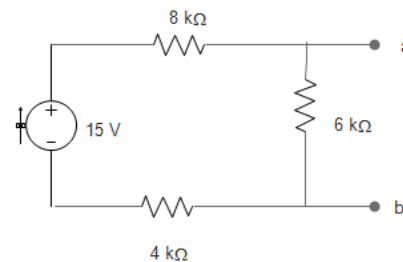
50. The function of connecting a resistor in series with gate-cathode circuit and Zener-diode across gate-cathode circuit are respectively to protect gate circuit from
- (A) Overvoltages, overcurrents
 - (B) Overcurrents, Overvoltages
 - (C) Overcurrents, noise signals
 - (D) Noise signals, overvoltages

51. When a UJT is used for triggering an SCR, the waveshape of the voltage obtained from UJT circuit is a
- (A) Sine wave
 - (B) Saw-tooth wave
 - (C) Trapezoidal wave
 - (D) Square wave

52. A three phase to 3-phase cycloconverter requires
- (A) 18 SCR for 3-pulse device
 - (B) 18 SCR for 6-pulse device
 - (C) 36 SCR for 3-pulse device
 - (D) 36 SCR for 9-pulse device

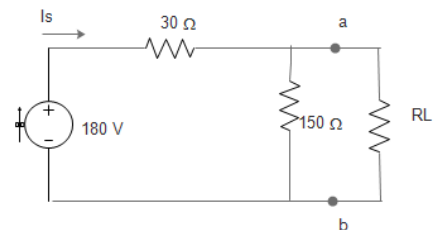
53. A single phase full wave midpoint thyristor converter uses a 230/200 V transformer with centre tap on secondary side. The P.I.V per thyristor is
- (A) 100 V
 - (B) 141.4 V
 - (C) 200 V
 - (D) 282.8 V

54. The value of Norton equivalent resistance and current for the given circuit is



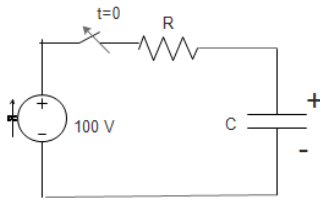
- (A) 4 kΩ, 1.25 mA
- (B) 6 kΩ, 1.35 mA
- (C) 12 kΩ, 1.5 mA
- (D) 8 kΩ, 1.5 mA

55. The value of load resistance that will result in maximum power delivered to the load for the circuits



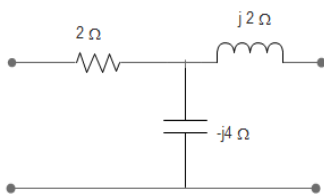
- (A) 25 Ω
- (B) 27 Ω
- (C) 26 Ω
- (D) 28 Ω

56. A 10-mF capacitor is charged to 100 V as given in circuit below. Find the energy stored by the capacitor and voltage of the capacitor at $t=0^+$ after the switch is opened.



- (A) 50 J
- (B) 100 J
- (C) 150 J
- (D) 200 J

57. Determine Z parameters of the ac circuit shown in fig below:



- (A) $Z_{11}=2-j4 \Omega$, $Z_{12}=Z_{21}=-j4 \Omega$, $Z_{22}=-j2 \Omega$
- (B) $Z_{11}=-j4 \Omega$, $Z_{12}=Z_{21}=2-j4 \Omega$, $Z_{22}=-j2 \Omega$
- (C) $Z_{11}=2-j4 \Omega$, $Z_{12}=Z_{21}=-j2 \Omega$, $Z_{22}=-j4 \Omega$
- (D) $Z_{11}=-j4 \Omega$, $Z_{12}=Z_{21}=-j2 \Omega$, $Z_{22}=-j4 \Omega$

58. In the given system, if $a=0.1$ the steady state error to unity ramp input will be

- (A) 0.16
- (B) 0.25
- (C) 0.35
- (D) 0.49

59. A certain linear time invariant system has the state and output equations given below

$$\text{below } \begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} I & -I \\ 0 & I \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ I \end{bmatrix} u$$

$$y = [1 \ 1] \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$$

If $X_1(0)=1$, $X_2(0)=-1$, $u(0)=0$ then $\frac{dy}{dt}$ at

- (A) 1
- (B) 0
- (C) -1
- (D) None of the above

60. To obtain very high input and output impedances in a feedback amplifier, the topology must be

- (A) Voltage-series
- (B) Current-series
- (C) Voltage-shunt
- (D) Current-shunt

61. The gain bandwidth product of two stage CE amplifier is

- (A) Same as that of one stage
- (B) Greater than one stage
- (C) Less than one stage
- (D) Product of two gain bandwidth products of each stage

62. As the temperature is increased, the voltage across diode carrying a constant current

- (A) Increases
- (B) Decreases
- (C) Remains constant
- (D) May increase or decrease depending upon the doping levels in the junction

63. The maximum percentage quantization error for a 12-bit analog to digital converter is

- (A) $\pm 0.00076\%$
- (B) $\pm 0.012207\%$
- (C) $\pm 3.125\%$
- (D) $\pm 4.17\%$

64. A 100/5A bar primary current transformer supplies an overcurrent relay set at 25% pick up and it has burden at 5 VA. The secondary voltage is

- (A) 1 V
- (B) 1.25 V
- (C) 2.5 V
- (D) 4 V

65. The duty cycle of a step down chopper is

- (A) $T_{on}/T_{on}+T_{off}$
- (B) $T_{off}/T_{on}+T_{off}$
- (C) $T_{on}+T_{off}/T_{on}$
- (D) $T_{on}+T_{off}/T_{off}$

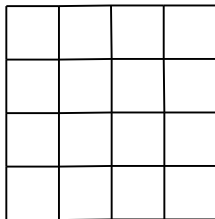
66. In motor circuit static frequency changers are used for
 (A) power factor improvement
 (B) improved cooling
 (C) reversal of direction
 (D) speed regulation
67. A modulus -12 ring counter requires a minimum of
 (A) 10 flip-flops
 (B) 12 flip-flops
 (C) 8 flip-flops
 (D) 6 flip-flops
68. Synchronization is achieved by a timing device called a
 (A) Strobe
 (B) Reset
 (C) CLK
 (D) Master clock generator
69. How many different Boolean functions of degree 4 are there
 (A) 2^4
 (B) 2^8
 (C) 2^{16}
 (D) 2^{12}
70. The 2's complement representation of decimal value -15 is
 (A) 1101
 (B) 11111
 (C) 111111
 (D) 10001
71. A Boolean function $x'y'+xy+x'y$ is equivalent to
 (A) $x'+y'$
 (B) $x+y$
 (C) $x'+y$
 (D) $x+y'$
72. Which of the following sets of complements are sufficient to implement any arbitrary Boolean function?
 (A) XOR gates, NOT gates
 (B) 2 to 1 multiplexors
 (C) Three-input gates that output $(A.B)+C$ for inputs A,B and C
 (D) AND gates , XOR gates
73. The solution of $(0110)_{16}+(10010)_{16}$ is
 (A) 1012016
 (B) 1112016
 (C) 00B016
 (D) 1002016
74. `printf("%c",100)`
 (A) prints 100
 (B) prints garbage
 (C) prints the ASCII equivalent of 100
 (D) none of the above
75. The value of an automatic variable that is declared but not initialized will be
 (A) 1
 (B) 0
 (C) Garbage
 (D) none of the above
76. What will be the value of the expression $4/6/3+7/3$?
 (A) 4
 (B) 2
 (C) 2.333
 (D) None of the above
77. The expression equivalent to `++*ptr` is
 (A) `*ptr++`
 (B) `(*ptr)++`
 (C) `ptr=ptr+1;`
 (D) none of the above
78. In C programming, which of the following operators has the highest precedence
 (A) Unary +
 (B) *
 (C) >=
 (D) ==
79. Function call to `fseek()` function to position the file pointer at the beginning of the file is
 (A) `fseek(fp,1L,0);`
 (B) `fseek(fp,1L,1);`
 (C) `fseek(fp,0L,0);`
 (D) `fseek(fp,0L,1);`
80. A ROM is used to store the table for multiplication of two 8-bit unsigned integers. The size of ROM required is
 (A) $256 K*10$
 (B) $64K*8$
 (C) $4K*16$
 (D) $64K*16$

81. There are 10 lamps in a hall. Each one of them can be switched on independently. The number of ways in which hall can be illuminated is
 (A) 10^2
 (B) 1023
 (C) 2^{10}
 (D) 10!
82. What is (?) in the following table?
- | | | |
|----|----|----|
| 8 | 54 | 27 |
| 9 | 71 | ? |
| 10 | 90 | 45 |
- (A) 39
 (B) 37
 (C) 35.5
 (D) 34.5
83. If 'THIS MAN IS GOOD' is coded as 153. What will be the code for 'THAT MAN IS NOT GOOD'?
- (A) 200
 (B) 195
 (C) 190
 (D) 180
84. A earned Rs 84000. One third of it went to taxes. The rest was invested and appreciated by one half. Two third of that went into business. Additional tax was paid equal to $\frac{2}{3}$ of the remaining amount. How much money was left with A?
- (A) 8790
 (B) 8777
 (C) 9000
 (D) 9333
85. If Aneesh is paternal first cousin of Rahul, how is their father's mother is related to them?
- (A) Mother
 (B) Grandmother
 (C) Paternal aunt
 (D) Maternal aunt
86. I got my first job on May 22, 1983. Which day of the week it was?
- (A) Monday
 (B) Tuesday
 (C) Friday
 (D) Sunday
87. A petrol dealer adds 20% kerosene oil to petrol. If purchase price of petrol is Rs. 60 per litre and that of kerosene is Rs. 20 per litre, and sale price of the petrol is Rs. 61 per litre, what is his percentage profit?
- (A) 14.25
 (B) 14.37
 (C) 14.50
 (D) 14.70
88. Anant parked his motorcycle at 9th place from the left and 28th from the right. How many motorcycles are parked in the row?
- (A) 37
 (B) 36
 (C) 35
 (D) 34
89. In an imaginary language digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are substituted by t, d, j, o, r, m, u, x, b and z. 10 is written as dt and so on. Use the above information and find the value of expression given below:
 $\{(or - dj) \times u\} \div dj$
- (A) 9
 (B) 10
 (C) 11
 (D) 12
90. Seven friends meet at their college reunion, shake hand with each other once. How many hand shake will be there altogether?
- (A) 21
 (B) 42
 (C) 27
 (D) 49
91. Ms Anandita starts at left and moves 8 Kms. She then turns right and moves 4 Kms. Then she turns right again for 8 Kms. How far is she from the initial position?
- (A) 20 Kms
 (B) 10 Kms
 (C) 08 Kms
 (D) 04 Kms
92. Lunch-dinner pattern of a person for 'm' days is given below. He has a choice of VEG or NON-VEG meal for his lunch/dinner.

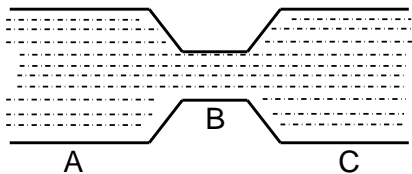
- (i) If he takes a NON-VEG lunch, he will have only VEG dinner
- (ii) He takes NON-VEG dinner for 9 days
- (iii) He takes VEG lunch for 11 days
- (iv) He takes a total of 14 NON-VEG meals

What is 'm'?

- (A) 18
 - (B) 20
 - (C) 24
 - (D) 38
93. 20% students of a particular course get jobs within one year of passing. 20% of the remaining students get jobs by end of the second year of passing. If 16 students are still jobless, how many students had passed the course?
- (A) 25
 - (B) 50
 - (C) 62
 - (D) 84
94. How many rectangles (which are not squares) in the following figure?:



- (A) 56
 - (B) 70
 - (C) 80
 - (D) 96
95. Water is flowing through a tube as shown below:



The cross-sectional area of A and C are equal and greater than the cross-sectional area of B. If the flow of water is steady, than the pressure on the walls at B is

- (A) less than that at A and that at C
- (B) more than that at A and that at C
- (C) same as that at A and that at C
- (D) more than that at A but less than that at C

96 Processor IC chip was developed by?

- (A) AMD
- (B) Intel
- (C) DIX
- (D) Both (A) and (B)

97 If $5472 = 9$, $6342 = 6$, $7584 = 6$. What is 9236?

- (A) 2
- (B) 3
- (C) 4
- (D) 5

98 Chipko movement was started by?

- (A) Arundhati Roy
- (B) Medha Patkar
- (C) Ila Bhatt
- (D) Sunder lal Bahuguna

99 What is the following is not a natural hazard?

- (A) Earthquake
- (B) Tsunami
- (C) Flash floods
- (D) Nuclear accident

100 Which of the following team won the 9th IPL cricket T-20 tournament?

- (A) Kolkata Knight Riders
- (B) Sun Risers Hyderabad
- (C) Mumbai Indians
- (D) Royal Challengers Bangalore