A.C.F. & F.R.O.-2018

प्रश्न-पत्र पुस्तिका एवं उत्तर पत्रक के पेपर सील/पॉलिथीन बैग को खोलने पर परीक्षार्थी यह सुनिश्चित कर लें कि उसके प्रश्न-पत्र पुस्तिका पर वही प्रश्न-पत्र पुस्तिका संख्या अंकित है जो उत्तर पत्रक पर अंकित है । इसमें कोई भिन्नता हो तो परीक्षार्थी वीक्षक से दूसरा प्रश्न-पत्र प्राप्त कर लें । ऐसा सुनिश्चित करने की जिम्मेदारी अभ्यर्थी की होगी ।
On opening the paper seal/polythene bag of the Question Paper Booklet the candidate should ensure that Question Paper Booklet No. of the Question Paper Booklet and Answer Sheet must be same. If there is any difference, candidate must obtain another Question Paper Booklet from Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश	INSTRUCTIONS FOR CANDIDATES
1. सभी प्रश्नों के उत्तर दीजिए ।	1. Answer **all** questions.
2. सभी प्रश्नों के अंक समान हैं ।	2. All questions carry equal marks.
3. प्रत्येक प्रश्न का केवल **एक** ही उत्तर दीजिए ।	3. Only **one** answer is to be given for each question.
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा ।	4. If more than one answers are marked, it would be treated as wrong answer.
5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमशः 1, 2, 3, 4 अंकित किया गया है । अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले अथवा बबल को उत्तर पत्रक पर **नीले बॉल प्वाइंट पेन** से गहरा करना है ।	5. Each question has four alternative responses marked serially as **1, 2, 3, 4**. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using **BLUE BALL POINT PEN**.
6. OMR उत्तर पत्रक इस परीक्षा पुस्तिका के अन्दर रखा है । जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल नीले बॉल पॉइंट पेन से विवरण भरें ।	6. The **OMR** Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully with **blue ball point pen** only.
7. प्रत्येक गलत उत्तर के लिए प्रश्न अंक का 1/3 भाग काटा जायेगा । गलत उत्तर से तात्पर्य अशुद्ध उत्तर अथवा किसी भी प्रश्न के एक से अधिक उत्तर से है । किसी भी प्रश्न से संबंधित गोले या बबल को खाली छोड़ना गलत उत्तर नहीं माना जायेगा ।	7. **1/3 part of the mark(s) of each question will be deducted for each wrong answer.** A wrong answer means an incorrect answer or more than one answers for any question. Leaving all the relevant circles or bubbles of any question blank will not be considered as wrong answer.
8. मोबाइल फोन अथवा इलेक्ट्रोनिक यंत्र का परीक्षा हॉल में प्रयोग पूर्णतया वर्जित है । यदि किसी अभ्यर्थी के पास ऐसी कोई वर्जित सामग्री मिलती है तो उसके विरुद्ध आयोग द्वारा नियमानुसार कार्यवाही की जायेगी ।	8. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable material with him/her will be strictly dealt as per rules.
9. कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानीपूर्वक सही भरें । गलत अथवा अपूर्ण रोल नम्बर भरने पर **5 अंक** कुल प्राप्तांकों में से काटे जा सकते हैं ।	9. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.

चेतावनी : अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, तो उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए विविध नियमों-प्रावधानों के तहत कार्यवाही की जाएगी । साथ ही विभाग ऐसे अभ्यर्थी को भविष्य में होने वाली विभाग की समस्त परीक्षाओं से विवर्जित कर सकता है ।

Warning : If a candidate is found copying or if any unauthorized material is found in his/her possession, F.I.R. would be lodged against him/her in the Police Station and he/she would liable to be prosecuted. Department may also debar him/her permanently from all future examinations.

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए ।
Do not open this Test Booklet until you are asked to do so.

14-□

1. Under no load condition, if the applied voltage to an induction motor is reduced from the rated voltage to half the rated value, read the following sentences and choose the correct option :
   (A) The speed decreases and the stator current increases
   (B) The speed and the stator current remain practically constant
   (C) Speed of the motor decreases
   (D) Stator Current of the motor decreases
   (1) Only (A) is correct
   (2) Only (B) is correct
   (3) Only (C) and (D) are correct
   (4) Only (D) is correct

2. A three-phase, 50 Hz, four-pole induction motor has a slip of 0.04 per unit when the output is 25 kW. The frictional loss is 300 W then the rotor speed becomes
   (1) 1380 RPM   (2) 1440 RPM
   (3) 1279 RPM   (4) 1450 RPM

3. When a synchronous motor is started, the field winding is energized
   (1) in the very beginning
   (2) after the motor has attained the synchronous speed and synchronized
   (3) When the motor attains a speed slightly less than Synchronous speed
   (4) Any time

4. The type of single-phase induction motor having the highest power factor at full load is
   (1) Shaded pole type
   (2) Split-phase type
   (3) Capacitor-start type
   (4) Capacitor-run type

5. A repulsion-start induction-run single phase motor runs as an induction motor only when
   (1) brushes are shifted to neutral plane
   (2) short-circuiter is disconnected
   (3) commutator segments are short-circuited
   (4) stator winding is reversed

6. For the maximum current during slip test on a synchronous machine, the armature aligns along
   (1) Direct axis
   (2) Quadrature axis
   (3) At 45° to direct axis
   (4) At 45° to quadrature axis

7. The MOSFET cannot block negative polarity voltage because
   (1) This can lead to breakdown of the material
   (2) It has an intrinsic anti-parallel diode
   (3) This can lead to damage of gate
   (4) None of these

8. In a half wave diode rectifier where a pure resistor is connected at the output terminals, the power factor at AC input terminals is
   (1) 0.707   (2) 1.0
   (3) 0.5   (4) 0.9

9. Which semiconductor power device, out of the following, is not a current triggered device ?
   (1) Thyristor   (2) GTO
   (3) TRIAC   (4) MOSFET

10. A thyristor can be switched from a non-conducting state to a conducting state by applying

(a) Voltage more than forward breakover voltage

(b) A voltage with high $\dfrac{dv}{dt}$

(c) Positive anode voltage with negative gate current

(d) Positive anode voltage with positive gate current

(1) (a), (b), (c) and (d) are correct.

(2) (a), (b), (d) are correct.

(3) (a), (b) and (c) are correct.

(4) (b), (c) and (d) are correct.

11. In a Buck DC-DC converter if input voltage is 20V and required output voltage is 05 volts then the required duty cycle becomes

(1) 0.35   (2) 0.75

(3) 0.25   (4) 0.83

12. A single-phase full-wave diode rectifier has mean output voltage of 200 V and the load resistance is 400 ohms. Determine the inductance required to limit the amplitude of second-harmonic current in the load to 0.06 A.

(1) 2.46 H   (2) 2.84 H

(3) 3.48 H   (4) 4.92 H

13. A step-up chopper has input voltage of 220 V and output voltage of 660 V. If the conducting time of thyristor-chopper is 100 μs, compute the pulse width of output voltage.

(1) 25 μs   (2) 50 μs

(3) 100 μs   (4) 150 μs

14. A dc to dc converter has an efficiency of 80% and is supplying a load of 24 W at 240V. What is the current drawn from the battery if the converter is working from a battery of 12 V ?

(1) 2.5 A   (2) 0.1 A

(3) 2.0 A   (4) 10 A

15. A single-phase voltage controller has input voltage of 230 V, 50 Hz and a load of 15 ohms for 6 cycles on and 4 cycles off, determine the root mean square output voltage.

(1) 84.0 V   (2) 118.7 V

(3) 126.0 V   (4) 178.2 V

16. In a 2-pulse bridge converter with freewheeling diode, the width of the diode current pulse is (α is the firing angle)

(1) $\pi + \alpha$ (2) $\pi - \alpha$

(3) π (4) 2π

17. A single-phase half-wave ac voltage controller feeds a load of 20 ohms with an input voltage of 230 V, 50 Hz. Firing angle of thyristor is 45°. Determine the root mean square value of output voltage.

(1) 224.7 V   (2) 317.7 V

(3) 158.9 V   (4) 275.3 V

18. For a power diode, the reverse recovery time is 3.9 μs and the rate of diode-current decay is 50 A/μs. For a softness factor of 0.3, the peak inverse current is

(1) 50 A   (2) 100 A

(3) 150 A   (4) 200 A

19. Despite the presence of negative feedback, control systems still have problems of instability because the

(1) System has large negative phase angle at high frequencies

(2) Mathematical analysis involves approximations.

(3) Components used have nonlinearities

(4) dynamic equations of the subsystems are not known exactly.

20. For the bode plot shown in below figure, state the correct statement
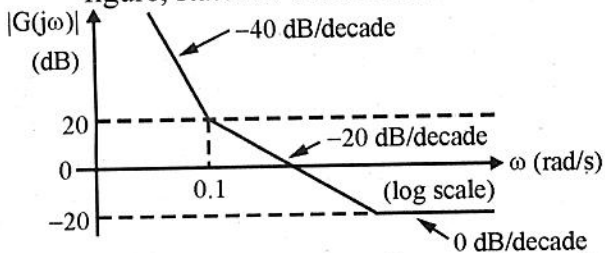
(1) The system has four poles and two zeros

(2) The system has two poles and two zeros

(3) The system has one zero and two poles

(4) None of these

21. Which of the following block diagrams can be reduced to transfer function $\dfrac{C(S)}{R(S)} = \dfrac{G_1}{1 - G_1, G_2}$

(a)

(b)

(c)

(d)

(1) (a) and (b)　　(2) (a) and (c)

(3) (b) and (c)　　(4) (c) and (d)
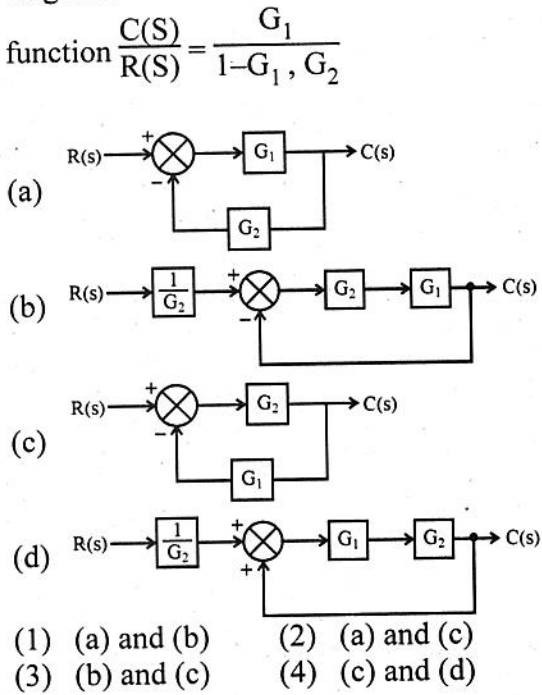
22. Consider the network function :

$$H(s) = \dfrac{2(S+3)}{(S+2)(S+4)}$$

What is the steady state response due to a unity step input ?

(1) 4/3　　　　(2) 1/2

(3) 1　　　　　(4) 3/4

23. A unity-feedback system has open-loop transfer function $K/[s(s+1)(s+2)]$; $K > 0$. The value of K that results in oscillatory response to step input, is

(1) 2　　　　　(2) 6

(3) 20　　　　(4) 60

24. If the Nyquist plot cuts the negative real axis at a distance of 0.4, then the gain margin of the system is

(1) 0.4　　　　(2) –0.4

(3) 5　　　　　(4) 2.5

25. A log compensator is basically a

(1) high pass filter

(2) band pass filter

(3) low pass filter

(4) band elimination filter

26. Consider the following statements about feedback control system and choose the correct option.

(a) If an open loop system is unstable, applying feedback can improve its stability

(b) If an open loop system is subject to parameter variations, applying feedback will improve robustness of the closed loop system

(1) Statement (a) is true but Statement (b) is false

(2) Statement (a) is false but Statement (b) is true

(3) Both statements are true

(4) Both statements are false

27. The state-space representation of a system is given by

$$X = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U \text{ and } Y = \begin{bmatrix} 1 \\ 1 \end{bmatrix} X$$

Then the transfer function of the system is

(1) $\dfrac{1}{S^2 + 3S + 2}$ (2) $\dfrac{S}{S^2 + 3S + 2}$

(3) $\dfrac{1}{S + 3}$ (4) $\dfrac{1}{S + 2}$

28. The system described by the following state-space equations :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -2 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u, \; x_1(0) =$$

$0, \; x_2(0) = 0$ and $y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

Choose the correct option for this system.

(1) The system is controllable and observable

(2) The system is controllable but not observable

(3) The system is neither controllable nor observable

(4) None of these is true

29. Given unity feedback system with $G(s) = \dfrac{K}{S(S+4)}$, what is the value of K for a damping ratio of 0.5 ?

(1) 1   (2) 16

(3) 4   (4) 2

30. If a system has two real and equal characteristic roots, it is described as

(1) having no damping

(2) being underdamped

(3) being critically damped

(4) being overdamped

31. A unity feedback system has open loop transfer function 25/[s(s+6)]. The peak overshoot in the step-input response of the system is approximately equal to

(1) 5%   (2) 10%

(3) 15%   (4) 20%

32. Consider the root-locus plot of unity feedback system with open loop transfer function K(s+5) / [s(s+2) (s+4) (s²+2s+2)]. The meeting point of the asymptotes on the real axis occurs at

(1) –1.2   (2) –0.85

(3) –1.05   (4) –0.75

33. The closed-loop dynamics of a system is of second-order. To improve the damping, we should

(1) decrease the phase margin

(2) increase the phase margin

(3) decrease the gain margin

(4) increase the gain margin

34. In pumped storage scheme, the generator is also used as

(1) induction generator or synchronous condenser

(2) induction generator or synchronous motor

(3) synchronous generator or induction generator

(4) synchronous motor or synchronous condenser

35. The incremental cost characteristics of two generators delivering a load of 200 MW are as follows

$$\frac{df_1}{dP_1} = 2.0 + 0.01\, P_1$$

$$\frac{df_2}{dP_2} = 1.6 + 0.02\, P_2$$

for economic operation of generators P_1 and P_2 should be

(1) 120 MW and 80 MW

(2) 80 MW and 100 MW

(3) 120 MW and 100 MW

(4) 80 MW and 80 MW

36. The inductance of a transmission line is minimum when

(1) GMD is high

(2) GMD is low and GMR is high

(3) both GMD and GMR are high

(4) GMR is high

37. Transient stability studies for Power System are conducted to determine

(A) Relaying and protective system settings

(B) Power transfer capability between systems

(C) Critical fault clearing times of circuit breakers

Choose the correct option :

(1) Only options (A) and (B) are correct

(2) Only options (B) is correct

(3) All options (A), (B) and (C) are correct

(4) Only option (C) is correct

38. To improve the steady-state stability limit of Power System ?

(A) Add transmission lines in parallel

(B) Use oversized conductors

(C) Use higher levels of transmission voltages

Choose the correct option :

(1) Only option (C) is correct.

(2) Only options (A) and (B) are correct.

(3) Only options (A) and (C) are correct.

(4) All three options (A), (B) and (C) are correct.

39. Why is ring main distribution system preferred to a radial system ?

(A) Voltage drop in the feeder is less

(B) Power factor is higher

(C) Supply is more reliable

Select the correct answer using code given below :

(1) (A) and (B) only

(2) (B) and (C) only

(3) (A) and (C) only

(4) (A), (B) and (C)

40. In modelling and analysis of transmission line, which of the following parameter is of least importance ?

(1) Series resistance

(2) Shunt capacitance

(3) Series inductance

(4) Shunt conductance

41. The positive sequence current of a transmission line is

(1) always zero

(2) 1/3 of negative sequence current

(3) equal to negative sequence current

(4) 3 times negative sequence current

42. For an unbalanced fault, with paths for zero-sequence currents, at the point of fault
(1) the negative and zero sequence voltages are minimum
(2) the negative and zero sequence voltages are maximum
(3) the negative sequence voltage is minimum and zero sequence voltage is maximum
(4) the negative sequence voltage is maximum and zero sequence voltage is minimum

43. Read the following sentences about bundled conductors used in transmission lines and choose the correct option.
(A) They reduce series reactance
(B) They reduce corona loss.
(C) They reduce interference with nearby communication lines
(1) Only (A) and (C) are correct
(2) All three options (A), (B) and (C) are correct
(3) Only option (B) is correct
(4) Only (B) and (C) are correct

44. In an over current protection the setting of the earth fault relay is
(1) less than the phase fault relay
(2) more than the phase fault relay
(3) equal to the phase fault relay
(4) the two settings are unrelated to each other

45. A certain 3-phase equilateral transmission line has a total corona loss of 53 kW at 106 kV and a loss of 98 kW at 110.9 kV. What is the disruptive critical voltage between lines ?
(1) 124.8 kV/km   (2) 62.4 kV/km
(3) 54.2 kV/km   (4) 27.1 kV/km

46. For a string insulator with four discs, the capacitance of the disc is ten times the capacitance between the pin and earth. Calculate the string efficiency.
(1) 45.98%   (2) 56.33%
(3) 65.02%   (4) 79.65%

47. The Y_{Bus} matrix of a 100-bus interconnected system is 90% sparse. Hence the number of transmission lines in the system must be
(1) 450   (2) 500
(3) 900   (4) 1000

48. Bulk power transmission over long HVDC lines are preferred on account of
(1) low cost of HVDC terminals
(2) no harmonic problems
(3) simple protection
(4) minimum line power losses

49. In 8085 micro processor, data bus and address-bus are multiplexed in order to
(A) Increase the speed of microprocessor
(B) Reduce the number of pins
(C) Connect more peripheral chips
Which of the above statements is/are correct ?
(1) (A) only
(2) (B) only
(3) (B) and (C) only
(4) (A), (B) and (C)

50. The number of memory cycle required to execute the following 8085 instructions :
(I) LDA3000H (II) LXID, FOF 1 H
would be
(1) 2 for (I) and 2 for (II)
(2) 4 for (I) and 3 for (II)
(3) 3 for (I) and 3 for (II)
(4) 3 for (I) and 4 for (II)

51. Which of the following instructions is a 3-byte instruction ?
(1) MVIA   (2) LDA XB
(3) MOV A, M (4) JMP 2050

52. An I/O processor control the flow of information between
(1) main memory and I/O devices
(2) Cache memory and I/O devices
(3) two I/O devices
(4) Cache and main memories

53. The interface chip used for data transmission between 8085 and a 16 bit ADC is
(1) Intel 8251   (2) Intel 8257
(3) Intel 8253   (4) Intel 8259

54. In 8085 processor SOD and SID pins are used for
(1) providing reset signal to processor
(2) providing power supply to the processor
(3) serial communication
(4) providing system clock

55. In 8086 microprocessor the following has the highest priority among all type interrupts.
(1) NMI   (2) DIV 0
(3) TYPE 255 (4) OVER FLOW

56. What will be the output of the following code ?
Float var = 3.278965;
cout <<setprecision(2);
cout <<var;
(1) 3.27   (2) 3.2
(3) 3.278965 (4) 3

57. In 8086 the overflow flag is set when
(1) The sum is more than 16 bits
(2) Signed numbers go out of their range after an arithmetic operation
(3) Carry and sign flags are set
(4) During subtraction

58. In a Zener diode large reverse current is due to
(1) Collision
(2) Presence of impurities
(3) rupture of bonds
(4) lower resistance in reverse biased region

59. In a common-emitter (CE) amplifier, the capacitor from emitter to ground is called the
(1) Coupling capacitor
(2) Decoupling capacitor
(3) Bypass capacitor
(4) Tuning capacitor

60. If the beta parameter of a certain transistor operating in the linear region is 30 and the base current is 1 mA, the collector current is
(1) 0.033 mA (2) 3 mA
(3) 30 mA   (4) 0.1 mA

61. NAND operation with x and y inputs is
(1) $\overline{x + y}$ (2) $\overline{x} + \overline{y}$
(3) $\overline{\overline{x} + y}$ (4) $(\overline{x} + \overline{y})(x + y)$

62. With a 100 kHz clock frequency, eight bits can be serially entered into a shift register in

(1) 80 μs   (2) 08 μs
(3) 80 ms   (4) 10 μs

63. The resolution of a 4-bit counting ADC is 0.5 volts. For an anlog input of 6.6 volts, the digital output of the ADC will be

(1) 1011   (2) 1101
(3) 1110   (4) 1100

64. According to the sampling theorem, the sampling frequency should be

(1) less than half the highest signal frequency
(2) greater than twice the highest signal frequency
(3) less than half the lowest signal frequency
(4) greater than the lowest signal frequency

65. If the circuit of the following figure has R_1 = 100 kΩ and R_f = 500 kΩ, what output voltage V_0 results for an input of V_1 = 2V ?
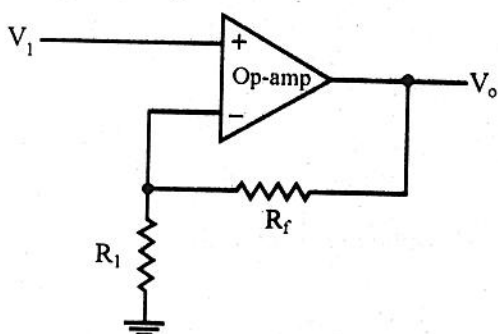
(1) 2.4 V   (2) 12 V
(3) −2.4 V   (4) −12 V

66. A feature that distinguishes the J-K flip-flop from the D flip-flop is the

(1) Toggle condition
(2) Preset input
(3) Type of clock
(4) Clear input

67. Which of the following is considered as an indirect method of generating FM ?

(1) Reactance modulator
(2) Balanced modulator
(3) Varactor diode modulator
(4) Armstrong system

68. A resistance is determined by voltmeter ammeter method. The voltmeter reads 100 V with a probable error of ± 12 V and ammeter reads 10 A with a probable error of ± 2A. Determine the probable error in computed value of resistance.

(1) ± 1.2 Ω   (2) ± 2.0 Ω
(3) ± 2.3 Ω   (4) ± 2.8 Ω

69. Kelvin double bridge is chosen to measure low resistance because

(1) resistance variation due to contacts of leads can be eliminated
(2) it has high sensitivity·
(3) thermoelectric emf's can be taken
(4) resistance variation due to temperature can be accounted for

70. The high torque to weight ratio in an analog indicating instruments indicates

(1) High friction loss
(2) Nothing as regards friction loss
(3) Low friction loss
(4) None of these

71. The ac bridge shown in the figure is balanced; if $Z_1 = 100 \angle 30°$, $Z_2 = 150 \angle 0°$, $Z_3 = 250 \angle -40°$ than Z_4 is equal to
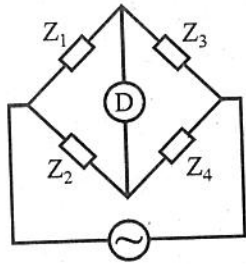
  (1) $375 \angle 0°$ (2) $375 \angle -70°$
  (3) $150 \angle 70°$ (4) $150 \angle 20°$

72. The coil of a 300 V moving iron voltmeter has a resistance of 500 Ω and an inductance of 0.8 H. The instrument reads correctly at 50 Hz ac supply and takes 100 mA at full scale deflection. What is the reading of instrument when it is connected to 200 V dc supply ?
  (1) 198.9 V   (2) 200.0 V
  (3) 200.7 V   (4) 201.1 V

73. In electro dynamometer - type watt meters, pressure coil inductance produce error which is
  (1) constant irrespective of load power factor
  (2) higher at low power factors of load
  (3) lower at low power factors of load
  (4) None of these

74. If an energy meter disc makes 10 revolutions in 100 seconds when a load of 450 W is connected to it. The meter constant (in rev/kWh) is
  (1) 1000   (2) 800
  (3) 1600   (4) 500

75. A strain gauge with a resistance of 250 Ω undergoes a change of 0.150 Ω during a test. The strain is 1.5×10^{-4}. Then the gauge factor is
  (1) 4   (2) 16
  (3) 12   (4) 8

76. An average-reading digital multimeter reads 10 V when fed with a triangular wave, symmetric about the time-axis. For the same input an rms reading meter will read
  (1) 30   (2) $30\sqrt{3}$
  (3) $10\sqrt{3}$ (4) $15\sqrt{3}$

77. An n-bit A/D converter is required to convert an analog input in the range of 0 – 5 volt to an accuracy of 10 mV. The smallest value of n which can achieve this accuracy is
  (1) 8   (2) 9
  (3) 10   (4) 16

78. How much current must flow in a loop of radius 1 m to produce a magnetic field of 1 mA/m. ?
  (1) 1.0 mA   (2) 1.5 mA
  (3) 2.0 mA   (4) 2.5 mA

79. By what name is the equation $\nabla \cdot \bar{J} = 0$ frequently known ?
  (1) Poisson's equation
  (2) Laplace's equation
  (3) Continuity equation for steady currents
  (4) Displacement equation

80. A parallel-plate capacitor has plates 0.15 mm apart and dielectric with relative permittivity of 3. Find the voltage between plates if the surface charge is 5×10^{-4} $\mu C/cm^2$.

(1) 0.94 V   (2) 1.62 V

(3) 2.82 V   (4) 3.42 V

81. A medium behaves like dielectric when the

(1) displacement current is almost negligible

(2) displacement current is just equal to the conduction current

(3) displacement current is less than the conduction current

(4) displacement current is much greater than the conduction current

82. Two thin parallel wires carry currents along the same direction. The force experienced by one, due to the other is

(1) Parallel to the lines

(2) Perpendicular to the lines and attractive

(3) Perpendicular to the lines and repulsive

(4) Zero

83. Which of the following is a Vector quantity ?

(1) Magnetic field intensity

(2) Magnetic potential

(3) Susceptibility

(4) Magnetic flux density

84. According to Gauss's theorem, the surface integral of the normal component of electric flux density D over a closed surface containing charge Q is (ε_0 is the permittivity of free space)

(1) Q   (2) Q/ε_0

(3) $\varepsilon_0 Q$ (4) Q^2/ε_0

85. What will be the value of the standing wave ratio when the reflection coefficient is ½ ?

(1) 4   (2) 3

(3) 2   (4) 1

86. A multilayer coil (solenoid) of 2000 turns of fine wire is 20 mm long and has a thickness 5 mm of winding. If the coil carries a current of 5 mA, the mmf generated is

(1) 500 A   (2) 2000 A

(3) 10 A   (4) None of these

87. Which of the following represent Maxwell's equation in differential form ?

(1) $\dfrac{\partial D}{\partial t} - J = \nabla \times \vec{H}$

(2) $\nabla \cdot \vec{E} = \dfrac{\partial \vec{H}}{\partial t}$

(3) $\nabla \times \vec{H} = J + \dfrac{\partial D}{\partial t}$

(4) $\nabla \times \vec{D} = \rho_v$

88. Identify the statement that is not true for ferromagnetic materials :
    (1) They have a large magnetic susceptibility
    (2) They have a fixed value of relative permeability
    (3) Energy loss is proportional to the area of the hysteresis loop.
    (4) They lose their nonlinearity property above the Curie temperature.

89. As compared to Si, the electron mobility in GaAs is
    (1) slower by about five times
    (2) same
    (3) faster by about six times
    (4) faster by about 200 times

90. Which of these materials requires the lowest value of magnetic field strength to magnetize it ?
    (1) Nickel
    (2) Silver
    (3) Tungsten
    (4) Sodium chloride

91. The readiness of a material to accept magnetism is expressed by its
    (1) permittivity
    (2) susceptibility
    (3) coercivity
    (4) permeability

92. The Fermi level depends on the length L of a linear solid as
    (1) $1/L^2$
    (2) $1/L^3$
    (3) $1/L$
    (4) independent of $1/L$

93. Exposure of insulating materials to moisture causes increase in
    (1) dielectric constant
    (2) dielectric loss
    (3) dielectric strength
    (4) insulation resistance

94. A suitable material for audio and TV transformers is
    (1) ferrite   (2) Fe-4% Si
    (3) Fe-30% Ni   (4) very pure Fe

95. When alternating flux of different frequency is passed through a ferromagnetic material then with increase in frequency and keeping the same flux
   (1) Area under B-H curve for this material will increase
    (2) Area under B-H curve for this material will decrease
    (3) Area under B-H curve for this material will not be affected
    (4) None of these

96. Air exhibits
    (1) ferromagnetism
    (2) Paramagnetism
    (3) antiferromagnetism
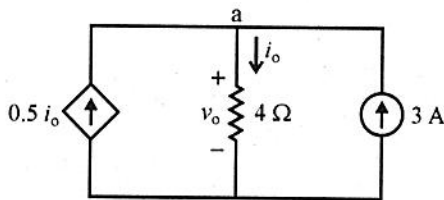   (4) ferrimagnetism

97. The maximum current that a 2W, 50 kΩ resistor can safely conduct is

(1) 6.3 mA (2) 40.4 mA

(3) 5.1 mA (4) 700.7 μA

98. In given figure, the value of Resistance R in Ω is
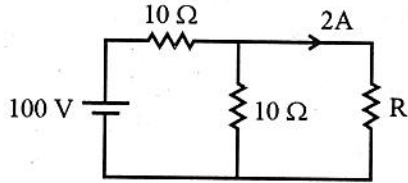
(1) 10 (2) 20

(3) 30 (4) 40

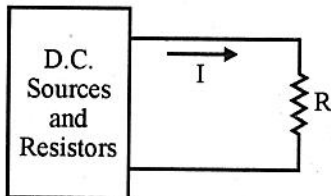**99.** The current i_0 in the circuit shown below is :

(1) 3A (2) 6A

(3) 2A (4) 1.5A

100. For the below network with only DC sources and resistors, the following statements are applicable :

If R = 3Ω then the current I = 1.5A

If R = 2Ω then the current I = 2A

Now If R = 0 then the value of current I becomes

(1) 0A (2) 12A

(3) 6A (4) 3A

101. Laplace transform of a time domain signal $x(t) = e^{-at} \sin w_o t$ will be for region of convergence (RoC) : Re (S) > − a

(1) $\dfrac{s}{(s-a)^2 + w_o^2}$ (2) $\dfrac{s}{(s+a)^2 - w_o^2}$

(3) $\dfrac{w_o}{(s+a)^2 - w_o^2}$ (4) $\dfrac{w_o}{(s+a)^2 + w_o^2}$

102. If a two-port is reciprocal, which of the following is not true ?

(1) $Z_{12} = Z_{21}$ (2) $Y_{12} = Y_{21}$

(3) $h_{12} = h_{21}$ (4) $AD = BC + 1$

103. A voltage $v = V \cos \omega t$ is applied to a circuit consists of inductor L, then the current response i_L in the circuit will be
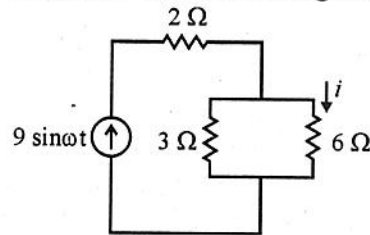
(1) $i_L = \dfrac{V}{\omega L} \cos (\omega t - 90°)$

(2) $i_L = \dfrac{V}{L} \cos (\omega t + 90°)$
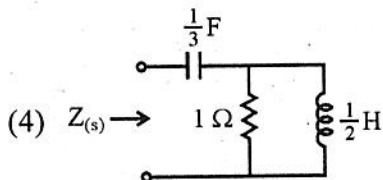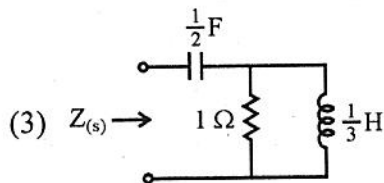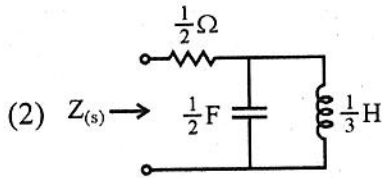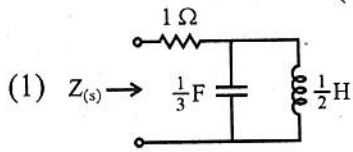
(3) $i_L = \dfrac{\omega L}{V} \cos (\omega t - 90°)$

(4) $i_L = \dfrac{L}{V} \cos (\omega t - 90°)$

104. The circuit shown below is excited by AC Current source of the instantaneous value of 9 sin ωt, then the instantaneous value of the current through the 6Ω resistor is given by


(1) 3 sin ωt (2) 4 sin ωt

(3) 6 sin ωt (4) 8 sin ωt

105. Which of the following networks represent the function $\dfrac{S^2 + 2S + 6}{S(S+3)}$?

(1) $Z_{(s)} \rightarrow$ [circuit: $1\,\Omega$ resistor, $\frac{1}{3}$F capacitor, $\frac{1}{2}$H inductor]

(2) $Z_{(s)} \rightarrow$ [circuit: $\frac{1}{2}\,\Omega$ resistor, $\frac{1}{2}$F capacitor, $\frac{1}{3}$H inductor]

(3) $Z_{(s)} \rightarrow$ [circuit: $\frac{1}{2}$F capacitor, $1\,\Omega$ resistor, $\frac{1}{3}$H inductor]

(4) $Z_{(s)} \rightarrow$ [circuit: $\frac{1}{3}$F capacitor, $1\,\Omega$ resistor, $\frac{1}{2}$H inductor]

106. In the given figure 12 V Battery is disconnected at $t = 0$. What is the voltage v accross Inductor for all times ?

[circuit: $t=0$ switch, $4\,\Omega$ resistor, 12 V battery, 0.1 H inductor $v_{(t)}$, $10\,\Omega$ resistor]
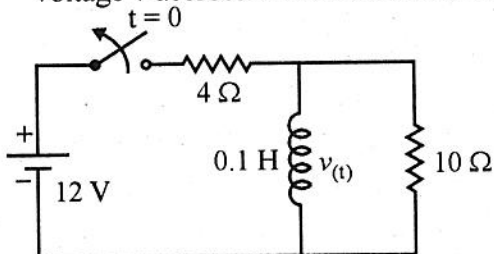
(1) $v_{(t)} = -3\,e^{-1000t}$
(2) $v_{(t)} = -30\,e^{-1000t}$
(3) $v_{(t)} = -30\,e^{-100t}$
(4) $v_{(t)} = -300\,e^{-100t}$

107. Two series resistors are connected to a sinusoidal ac source. If there is 6.5 V rms across one resistor and 3.2 V rms across the other, the peak source voltage is

(1) 9.7 V   (2) 3.3 V
(3) 21.8 V   (4) 13.7 V

108. Q-factor of a series R-L-C circuit possessing resonant frequency of $10H_2$ and bandwidth of $5H_2$ is

(1) 0.5   (2) 2
(3) 2.5   (4) 5

109. If the three-winding transformer is connected as in the figure below, the value of the output voltage is :

[circuit: 50 V input, 2 V winding, 8 V winding, V_o output]
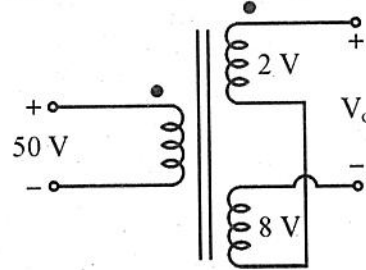
(1) 10   (2) 6
(3) -6   (4) -10

110. In a certain series resonant circuit, Voltage across capacitor $V_C = 150$ V, Voltage across inductor $V_L = 150$ V, and voltage across resistor $V_R = 50$ V then the value of the source voltage is

(1) 350V   (2) 50V
(3) 300V   (4) 250V

111. An RL circuit has R = 2 ohm and L = 4 H. The time needed for the inductor current to reach 40 percent of its steady-state value is :

(1) 0.5 s   (2) 1 s
(3) 2 s   (4) 4 s

112. For a 4-pole, 2-layer, d.c., lap-winding with 20 slots and one conductor per layer, the number of commutator bars is

(1) 80   (2) 20
(3) 40   (4) 160

113. If a self-excited dc generator after being installed fails to build up on its first trial run, the first thing to do is to

(1) increase the field resistance

(2) check armature insulation

(3) reverse field connections

(4) increase the speed of prime mover

114. In an electromechanical energy conversion device, the developed torque depends upon

(1) Stator field strength and torque angle

(2) Stator field strength and Rotor field strength

(3) Stator field strength only

(4) Stator field and rotor field strength and torque angle

115. A separately excited DC generator has an armature resistance of 0.1Ω and negligible armature inductance. At rated field current and rated rotor speed, its open-circuit voltage is 200 V. When this generator is operated at half the rated speed, with half the rated field current what will be the terminal voltage ?

(1) 50V   (2) 100V

(3) 150V   (4) 75V

116. If applied voltage of an ideal transformer is increased by 50% and frequency is reduced to 50% (assuming magnetic circuits remain unsaturated), if the original maximum flux density is B_{max} then the new flux density is

(1) $0.5 B_{max}$ (2) $3 B_{max}$

(3) $1.5 B_{max}$ (4) B_{max}

117. Compensating winding in a dc machine is placed

(1) In armature slots

(2) On Yoke in the interpolar gap

(3) On Yoke in the pole faces

(4) On Partly in armature slots and partly in pole faces

118. A stand-alone engine-driven synchronous generator is feeding a partly inductive load. A capacitor is now connected across the load to completely nullify the inductive current. For this operating condition

(1) field current and fuel input have to be reduced

(2) field current and fuel input have to be increased

(3) field current has to be increased and fuel input left unaltered

(4) field current has to be reduced and fuel input left unaltered

119. The efficiency of a power transformer is around

(1) 50%   (2) 60%

(3) 80%   (4) 95%

120. Two transformers A and B having equal outputs and voltage ratios but unequal percentage impedances of 4 and 2 are operating in parallel. Transformer A will be running overload by _____ percent.

(1) 25   (2) 33

(3) 50   (4) 66