प्रश्नपुस्तिका क्रमांक
BOOKLET No.

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प्रश्नपुस्तिका-I **R13** संच क्र.

A

विद्युत अभियांत्रिकी पेपर – 1

एकूण प्रश्न : 100
एकूण गुण : 200

वेळ : 2 (दोन) तास

सूचना

(1) सदर प्रश्नपुस्तिकेत **100 अनिवार्य प्रश्न** आहेत. उमेदवारांनी प्रश्नांची उत्तरे लिहिण्यास सुरुवात करण्यापूर्वी या प्रश्नपुस्तिकेत सर्व प्रश्न आहेत किंवा नाहीत याची खात्री करून घ्यावी. तसेच अन्य काही दोष आढळल्यास ही प्रश्नपुस्तिका समवेक्षकांकडून लगेच बदलून घ्यावी.

(2) आपला परीक्षा-क्रमांक ह्या चौकोनांत
न विसरता बॉलपेनने लिहावा.

परीक्षा-क्रमांक

केंद्राची संकेताक्षरे   शेवटचा अंक

(3) वर छापलेला प्रश्नपुस्तिका क्रमांक तुमच्या उत्तरपत्रिकेवर विशिष्ट जागी उत्तरपत्रिकेवरील सूचनेप्रमाणे **न विसरता नमूद करावा.**

(4) या प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाला 4 पर्यायी उत्तरे सुचविली असून त्यांना 1, 2, 3 आणि 4 असे क्रमांक दिलेले आहेत. त्या चार उत्तरांपैकी सर्वात योग्य उत्तराचा क्रमांक उत्तरपत्रिकेवरील सूचनेप्रमाणे तुमच्या उत्तरपत्रिकेवर नमूद करावा. अशा प्रकारे उत्तरपत्रिकेवर उत्तरक्रमांक नमूद करताना तो संबंधित प्रश्नक्रमांकासमोर छायांकित करून दर्शविला जाईल याची काळजी घ्यावी. **ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.**

(5) सर्व प्रश्नांना समान गुण आहेत. यास्तव सर्व प्रश्नांची उत्तरे द्यावीत. घाईमुळे चुका होणार नाहीत याची दक्षता घेऊनच शक्य तितक्या वेगाने प्रश्न सोडवावेत. क्रमाने प्रश्न सोडविणे श्रेयस्कर आहे पण **एखादा प्रश्न कठीण वाटल्यास त्यावर वेळ न घालविता पुढील प्रश्नांकडे वळावे.** अशा प्रकारे शेवटच्या प्रश्नापर्यंत पोहोचल्यानंतर वेळ शिल्लक राहिल्यास कठीण म्हणून वगळलेल्या प्रश्नांकडे परतणे सोईस्कर ठरेल.

(6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही.

(7) प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवाराच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच ''उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची दिलेल्या चार उत्तरांपैकी सर्वात योग्य उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चार चुकीच्या उत्तरांसाठी एका प्रश्नाचे गुण वजा करण्यात येतील''.

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

1. In the diagram given below, the family of torque-slip characteristics of 3-phase induction motor have curves at
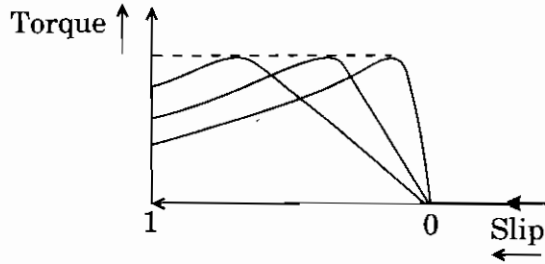
(1) different values of input voltage

(2) different values of rotor resistance

(3) different values of input frequency

(4) different values of rotor reactance

2. The equivalent circuit of a double cage rotor induction motor is equivalent to two rotor circuits connected in

(1) Parallel   (2) Series

(3) Series-parallel   (4) Either 1 or 2

3. A 50 Hz induction motor operates well on 60 Hz supply provided its terminal voltage is

(1) Reduced to 5/6 of its name-plate rating

(2) Raised to 2/3 of its name-plate rating

(3) Raised to 6/5 (ie. 120%) of its name-plate rating

(4) Does not operate at all

4. The best method of control of speed of a 3-phase induction motor over a wide range, amongst the given options is

(1) variable voltage, variable frequency control

(2) rotor resistance control

(3) pole changing

(4) input voltage control

5. Star-delta starting of 3-phase induction motor is equivalent to auto-transformer starting with

(1) 85% tapping   (2) 58% tapping

(3) 52% tapping   (4) 33% tapping

6. VFD for induction motor control is popularly used in industries because

(1) VFD allows direct connection of stator terminals to input supply terminals of grid

(2) VFD allows energy conservation and smooth control of speed

(3) VFD is the only method which is available commercially

(4) All the above

7. The length of air gap between stator and rotor of an induction motor is made as small as practicable because otherwise

(1) The magnetizing current will be more

(2) The ball bearings which can match the respective stator and rotor may not be available

(3) The power factor will be zero

(4) The labour cost during manufacturing increases

8. The speed control method of induction motor by changing the number of stator poles is easily applicable to

(1) Slip-ring induction motor of large rating only

(2) Squirrel-cage induction motor only

(3) Both, slip-ring and squirrel-cage induction motors

(4) Wound-rotor motors of small rating only

9. At full load, the speed of an induction motor is

(1) more than its synchronous speed

(2) same as its synchronous speed

(3) half of its synchronous speed

(4) slightly less than its synchronous speed

10. In a 3-phase, 4-pole 50 Hz induction motor running at 1450 rpm, the frequency of rotor currents will be

(1) 50 Hz

(2) 1·66 Hz

(3) 6·1 Hz

(4) 1·72 Hz

11. In case of synchronous motor, which of the following sentences are *true* ?

a. Synchronous motor is not self-starting.

b. If the rotor poles are excited by field current and the stator terminals are connected to AC supply, motor vibrates.

c. Variable frequency supply is used to start synchronous motor.

d. By using frequency converter, a synchronous motor can be brought from standstill to its desired speed.

Answer options :

(1) Only a and b are true

(2) Only b and c are true

(3) All are true

(4) None of the above

12. Which of the following sentences are *true* ?

a. Like most rotating machines, the synchronous machine can also operate as both, generator and motor.

b. Linear version of synchronous motor is considered for high speed transportation system.

c. A synchronous machine is doubly excited machine.

d. Synchronous motors are as widely used as induction motors.

Answer options :

(1) All are true

(2) a, b and c are true

(3) d is true

(4) a and d are true

13. Which of the following statements are *true* ?

a. As load increases armature current decreases, regardless of excitation.

b. For under and overexcited motors, power factor tends to approach zero with increase in load.

c. With normal excitation when load is increased, change in armature current is greater than in power factor which tends to become increasingly leading.

d. Both with under and overexcitation, change in power factor is greater than in armature current with increase in load.

Answer options :

(1) a, b and c are true

(2) Only c is true

(3) Only d is true

(4) None of the above

14. Which of the following sentences are *true* ?

    a. Low speed multipolar synchronous machines have salient poles and uniform air gaps.

    b. Low speed multipolar synchronous machines have salient poles and non-uniform air gaps.

    c. Magnetic reluctance is high along poles and low between poles.

    d. Magnetic reluctance is low along poles and high between poles.

    Answer options :

    (1) a and c are true

    (2) b and d are true

    (3) a is true

    (4) c and d are true

15. A linear induction motor has 98 poles and a pole pitch of 50 cm. Determine the synchronous speed and the vehicle speed in km/hr, if frequency is 50 Hz and slip is 0·25.

    (1) 180 km/hr, 135 km/hr

    (2) 135 km/hr, 180 km/hr

    (3) 180 km/hr, 130 km/hr

    (4) 185 km/hr, 135 km/hr

16. Synchronous motor operates at

    (1) Lagging power factor only

    (2) Leading power factor only

    (3) Unity power factor only

    (4) All of the above

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

17. A synchronous motor on load draws a current at a leading pf angle. If the internal pf angle, which is the phase angle between the excitation emf and the current in the time-phasor diagram, is ψ, then the air-gap excitation mmf lags the armature mmf by

  (1) ψ

  (2) $\dfrac{\pi}{2} + \psi$

  (3) $\dfrac{\pi}{2} - \psi$

  (4) $\psi + \phi$

18. While starting a 3-phase synchronous motor, it's field winding should be
  (1) kept open
  (2) short-circuited
  (3) connected to a dc source
  (4) None of the above

19. A salient-pole synchronous motor is running clockwise at no-load. If its field current is reduced to zero and then reversed, then
  (1) the motor would stop
  (2) the motor would run in the reverse direction
  (3) the motor slips by one pole-pitch and continues running at synchronous speed
  (4) the motor slips by one pole-pitch and speed would be less than synchronous speed

20. A single-phase synchronous motor having non-projected poles which does *not* need any excitation to rotor is known as
  (1) Reluctance motor
  (2) Repulsion motor
  (3) Hystresis motor
  (4) Shaded pole motor

21. The following parameter in op-amp is not a temperature sensitive parameter.

   (1) Input resistance

   (2) Power consumption

   (3) Open loop voltage gain

   (4) Output short circuit current

22. Which of the following sentences are *true* ?

   a. When D/A converter is used in conjunction with multiplexer the maximum rate at which converter can operate must be considered.

   b. When D/A converter is used with multiplexer the minimum rate at which converter can operate must be considered.

   c. Each time data is shifted into register, transience appear at the output of the converter. This is due to different rise and fall times of each flip-flop.

   d. The settling time is the main factor determining maximum rate of multiplexing.

   Answer options :

   (1) a, c and d are true

   (2) Only b is true

   (3) a and b are true

   (4) b and c are true

23. AND-OR realization is equivalent to

   (1) NAND-NAND

   (2) NOR-NOR

   (3) OR-AND

   (4) None of the above

24. The breakdown voltage in a zener diode

   (1) is almost constant

   (2) is very small

   (3) may destroy the diode

   (4) decreases with increase in current

25. Which of the following sentences are *true* ?

a. Two simple but important tests performed to check the operation of D/A converter are transient test and monotonocity test.

b. Two simple but important tests performed to check the operation of D/A converter are steady state accuracy test and monotonocity test.

c. Checking monotonicity means checking output voltage increase as the input digital signal increases.

d. For proper monotonicity the output waveform should be perfect ramp waveform.

Answer options :

(1) Only a is true   (2) b and c are true

(3) b, c and d are true   (4) Only d is true

26. Output impedance of ideal OP-AMP is

(1) low   (2) high

(3) infinite   (4) zero

27. Logic circuits are

(1) analog circuits

(2) digital circuits

(3) hybrid circuits

(4) None of the above

28. Which of the following sentences are true ?

a. A dual slope A/D converter is slower than other types of A/D converter.

b. D/A converters use various inverters, gates and flip-flops.

c. A/D converters use R to R connecting resistors.

d. Successive approximation method has much faster conversion time.

Answer options :

(1) a and b are true

(2) Only b is true

(3) b and c are true

(4) a and d are true

29. Which of the following sentences are *true* ?

   a.   Flip flop is often called as latch.

   b.   In R-S flip flop S = 1, flip flop is set Q = 0.

   c.   In R-S flip flop R = 1, flip flop is reset Q = 1.

   d.   Flip flop is a memory device.

Answer options :

   (1)   a and d are true

   (2)   a and b are true

   (3)   b and c are true

   (4)   c and d are true

30. In the summing amplifier shown below
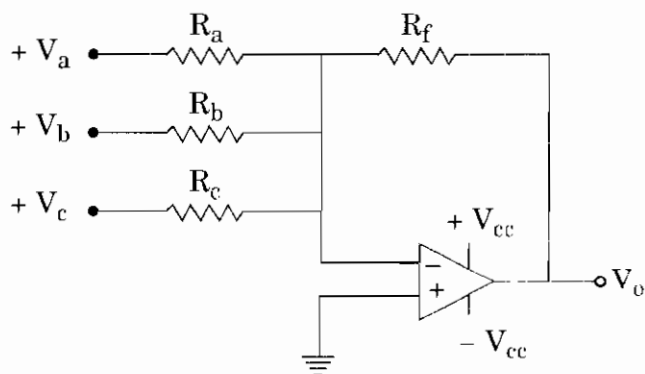
$V_a = 1$ V, $V_b = 2$ V, $V_c = 3$ V

$R_a = R_b = R_c = 3$ kΩ, $R_f = 1$ kΩ

Supply voltage = $\pm$ 15 V

Determine the V_0 – output voltage

   (1)   2 V

   (2)   – 2 V

   (3)   4 V

   (4)   – 4 V

31. The desirable static characteristics of a measuring system are

    (1)   Accuracy   (2)   Sensitivity

    (3)   Reproducibility   (4)   All of the above

32. The secondary of CT is never left open-circuited because

    (1)   heat dissipation in the core will be very large

    (2)   the core will be saturated and permanently magnetised rendering it useless

    (3)   dangerously high emfs will be induced in the secondary

    (4)   All of the above

33. The device used for measurement of temperatures exceeding 1500° C is

    (1)   RTD

    (2)   Radiation pyrometer

    (3)   Thermocouple

    (4)   Thermopile

34. The overall transfer function C(s)/R(s) of the system shown in the figure below is
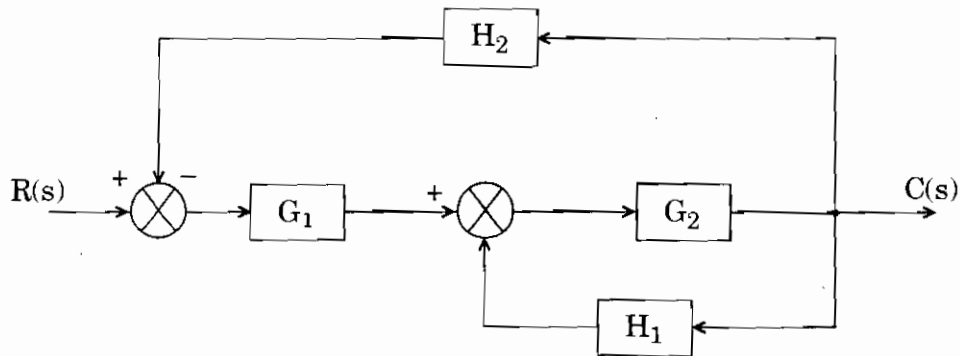
    (1) $\dfrac{G_1 G_2}{1 - G_1 H_2 + G_1 G_2 H_1}$ (2) $\dfrac{G_1 G_2}{1 + G_1 H_1 - G_1 G_2 H_2}$

    (3) $\dfrac{G_1 G_2}{1 + G_2 H_1 + G_1 G_2 H_2}$ (4) $\dfrac{G_1 G_2}{G_2 H_1 - G_1 H_1 G_2}$

35. The Nyquist plot of an open loop transfer function $G(j\omega)$ $H(j\omega)$ of a system encloses the $(-1, 10)$ point. The gain margin of the system is

(1) less than zero

(2) zero

(3) greater than zero

(4) infinity

36. Which of the following sentences are *true* ?

a. The device which converts the energy from one form to another is called transducer.

b. Bourdon tube is secondary type of transducer.

c. In most measurement systems, electrical device acts as primary detector.

d. Sensing element is not part of transducer.

Answer options :

(1) a, b and c are true

(2) b, c and d are true

(3) Only a is true

(4) Only d is true

37. Which of the following statements are *true* ?

a. Strain gauges are based on piezo-resistive effect.

b. The strain gauges should have high resistance coefficient.

c. The gauge factor is defined as the ratio of per unit change in resistance to per unit change in length.

d. Strain gauge should have low value of gauge factor to result high sensitivity.

Answer options :

(1) Only b is true

(2) b and c are true

(3) a and c are true

(4) c and d are true

38. Which of the following sentences are *true* ?

    a. The most widely used inductive transducer is the Linear Variable Differential Transducer.

    b. LVDT consists of single primary and two secondary windings in series opposition.

    c. Linearity of 0·05 is available in commercial LVDT.

    d. LVDT is sensitive to stray magnetic fields.

    Answer options :

    (1) Only a is true

    (2) b, c, d are true

    (3) All are true

    (4) None of the above

39. Which of the following sentences are *true* ?

    a. In resistive thermometer, the change in resistance of material per unit change in temperature should be as small as possible.

    b. Thermometers are semiconductors which behave as resistors with high positive temperature coefficient.

    c. Thermometers are composed of metallic oxides.

    d. Thermometers are used for measurement of level flow and pressure of liquids.

    Answer options :

    (1) a and b are true

    (2) b and c are true

    (3) only c is true

    (4) only d is true

40. A set of independent current measurements are recorded as 10·03, 10·10, 10·11 and 10·08 A. Calculate (a) average current, and (b) range of error.

    (1) a = 10·08 A, b = ± 0·04 A

    (2) a = 10·08 A, b = ± 0·05 A

    (3) a = 10·05 A, b = ± 0·05 A

    (4) a = 10·05 A, b = ± 0·04 A

41. Load curve for fan type of load is (ω is speed)

    (1) $T \times \omega$

    (2) $T \times \omega^2$

    (3) $T \times \omega^3$

    (4)   None of the above

42. A single-phase full converter is supplied from 230 V, 50 Hz source. Load is R-L load. At $\alpha = 60°$, calculate average dc voltage.

    (1)   103·5 V   (2)   206 V

    (3)   230 V   (4)   320 V

43. In VFD of induction motor, if stator frequency is varied till its rated frequency, then drive operates in

    (1)   constant torque region

    (2)   constant power region

    (3)   (1) and (2) both

    (4)   None of the above

44. In single width pulse modulation of PWM inverter, third harmonic can be eliminated if pulse width is equal to

    (1)   30°

    (2)   60°

    (3)   120°

    (4)   None of the above

45. If chopper frequency is 1 kHz and on time is 0·5 m sec., the duty cycle is

    (1)   0·6

    (2)   0·5

    (3)   0·8

    (4)   None of the above

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46. For continuous conduction in single-phase full converter, each pair of SCP's conducts for

    (1) π radian   (2) $\pi - \alpha$ radian

    (3) $\pi + \alpha$ radian   (4) α radian

47. For controlling the speed of dc motor of 200 hp rating, the following type of converter is normally used :

    (1) Single-phase full converter

    (2) Single-phase dual converter

    (3) Three-phase full converter

    (4) Three-phase dual converter

48. In ac drives, stable operating point is when

    (1) Load torque is equal to electromagnetic torque

    (2) Load torque is greater than electromagnetic torque

    (3) Load torque is less than electromagnetic torque

    (4) None of the above

49. A single-phase voltage source inverter has square wave input voltage. If pure inductive load is connected to it, the nature of load current waveform will be

    (1) square   (2) sinusoidal

    (3) triangular   (4) trapezoidal

50. A dc chopper is fed from 200 V dc. Output voltage is rectangular pulses with $T_{on} = 1$ ms and $T = 3$ ms. The average output voltage and ripple factor for this chopper are

    (1) 66·66 V, 1

    (2) 50 V, 1

    (3) 66·66 V, 1·5

    (4) None of the above

51. The bus admittance matrix of a power system is given as

$$
\begin{array}{c@{\quad}ccc}
 & 1 & 2 & 3 \\
1 & -j50 & +j10 & +j5 \\
2 & +j10 & -j30 & +j10 \\
3 & +j5 & +j10 & -j25
\end{array}
$$

The impedance of line between bus 2 and bus 3 will be equal to

(1) $+j0·1$ (2) $-j0·1$ (3) $+j0·2$ (4) $-j0·2$

52. A system has connected load of 120 kW, peak load of 100 kW, base load of 25 kW and average load of 48 kW. The load factor of the consumer is

(1)   40%   (2)   48%   (3)   25%   (4)   83·3%

53. Overhead transmission lines are transposed because

(1)   Efficiency improves

(2)   Voltage regulation improves

(3)   Unbalance reduces

(4)   None of the above

54. The bus impedance matrix of a 4-bus power system is given by

$$
Z_{bus} = \begin{bmatrix}
j0·3435 & j0·2860 & j0·2723 & j0·2277 \\
j0·2860 & j0·3408 & j0·2586 & j0·2414 \\
j0·2723 & j0·2586 & j0·2791 & j0·2209 \\
j0·2277 & j0·2414 & j0·2209 & j0·2791
\end{bmatrix}
$$

A branch having an impedance of $j0·2\ \Omega$ is connected between bus 2 and the reference. Then the values of Z_{22}, new and Z_{23}, new of the bus impedance matrix of the modified network are respectively

(1) $j0·5408\ \Omega$ and $j0·4586\ \Omega$

(2) $j0·1260\ \Omega$ and $j0·0956\ \Omega$

(3) $j0·5408\ \Omega$ and $j0·0956\ \Omega$

(4) $j0·1260\ \Omega$ and $j0·1630\ \Omega$

55. Diversity factor in a power system is

(1) always less than unity

(2) normally less than unity

(3) always more than unity

(4) normally more than unity

56. Series compensation of long transmission line results in

(1) Lower voltage drop only

(2) Maximum power transfer only

(3) Lower voltage drop and maximum power transfer

(4) Higher voltage drop

57. A sample power system network is shown in the figure. The reactances marked are in pu. What is the pu value of Y_{22} of the Bus Admittances Matrix (Y_{Bus})?
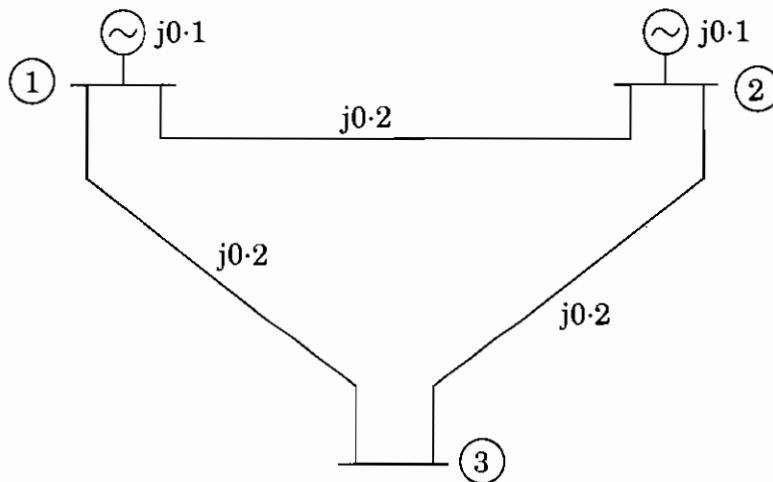
(1) $j10.0$

(2) $j0.5$

(3) $-j0.1$

(4) $-j20.0$

58. A 10 km lossless line has a reactance of 0·3 Ω/km. The ABCD constants are

(1) $\begin{bmatrix} 1 & 0 \\ 0\cdot3 & 1 \end{bmatrix}$

(2) $\begin{bmatrix} 1 & j3 \\ 0 & 1 \end{bmatrix}$

(3) $\begin{bmatrix} j3 & 0 \\ 1 & 1 \end{bmatrix}$

(4) $\begin{bmatrix} 1 & 0 \\ j3 & 1 \end{bmatrix}$

59. Which of the following sentence is more correct with respect to power flow in transmission system ?

(1) Change in voltage magnitude affects real power

(2) Change in load angle affects reactive power

(3) Change in voltage affects frequency

(4) Change in load angle affects real power

60. In the symmetrical component expression of voltages, we have

$$\begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} = [A] \begin{bmatrix} V_{a1} \\ V_b 2 \\ V_{a0} \end{bmatrix}$$

where matrix [A] is

(1) $\begin{bmatrix} 1 & \alpha & 1 \\ \alpha^2 & \alpha & 1 \\ \alpha & \alpha^2 & 1 \end{bmatrix}$

(2) $\begin{bmatrix} 1 & \alpha & \alpha^2 \\ 1 & \alpha^2 & \alpha \\ 1 & \alpha & \alpha^2 \end{bmatrix}$

(3) $\begin{bmatrix} 1 & 1 & 1 \\ \alpha^2 & \alpha & 1 \\ \alpha & \alpha^2 & 1 \end{bmatrix}$

(4) $\begin{bmatrix} 1 & 1 & 1 \\ \alpha & \alpha^2 & 1 \\ \alpha^2 & \alpha & 1 \end{bmatrix}$

61. Stringing charts of transmission lines are curves between

(1) Sag versus tension   (2) Sag and tension versus temperature

(3) Sag versus height   (4) Tension versus height

---

62. Voltage stability is also known as load stability and is strongly influenced by

a. Dynamic characteristics and static response of the load.

b. The load characteristics, set of parameters such as power factor or variation of active and reactive powers with voltage and frequency.

c. The frequency dependency of active and reactive power.

d. Load, a device connected to power system that consumers active or reactive power.

Identify the incorrect statements.

(1) a and b   (2) b and c   (3) a and c   (4) a and d

---

63. For transient stability analysis, as long as equal area criterion is satisfied, the maximum angle to which rotor angle can oscillate is

(1) 90°   (2) 45°

(3) Greater than 90°   (4) Less than 90°

---

64. The resistance and reactance of a short line are equal. At zero regulation, the load will be

(1) Unity power factor   (2) Zero power factor

(3) 0·707 lag   (4) 0·707 lead

---

65. The load frequency control is the basic control mechanism. Whenever there is variation in load demand, there is unbalance between real power input and output. The difference is supplied by the energy of rotating parts given by $KE = \frac{1}{2} I \omega^2$.

In this connection, which of the following statements are ***incorrect*** ?

a. If KE reduces, ω decreases, speed falls and frequency increases.

b. The change in frequency is sensed and fed back to control the position of inlet valve of prime movers.

c. The input to prime movers tries to bring the balance between real power input and output.

d. The frequency variation is not dependent on real power balance of the system.

Answer options :

(1) a and d   (2) b and d   (3) b and c   (4) a and c

66. Which of the following mainly leads to voltage instability ?

   (1) Transfer of reactive power

   (2) Transfer of active power

   (3) Transfer of dc power

   (4) Transfer of harmonic power

67. Generally in load flow solutions, the load is modelled as a

   (1) constant impedance load

   (2) constant power load

   (3) constant current load

   (4) dynamically varying load

68. What is the minimum safety factor in respect to the conductor tension ?

   (1) 1

   (2) 2

   (3) 3

   (4) 1·5

69. The receiving-end voltage for a long line under no-load condition is

   (1) less than the sending-end voltage

   (2) more than the sending-end voltage

   (3) equal to the sending-end voltage

   (4) Any of the above

70. The slack bus has to be a

   (1) Generator bus

   (2) Load bus

   (3) Generator or Load bus

   (4) Neither generator nor load bus

71. Which of the following statements are *true* ?

   a. R_C or R_L transient circuit with one capacitor and inductor is called as first order circuit.

   b. To obtain voltage and current in the circuit differential equations are solved.

   c. Voltage across capacitor cannot be changed suddenly.

   d. In steady state with independent DC sources capacitors behave as short circuit.

   Answer options :

   (1) a and b are true

   (2) b and c are true

   (3) c and d are true

   (4) a, b and c are true

72. A current of 2 A flows for 10 hours through a 100 ohm resistor. The energy consumed by the resistor will be

   (1) 0·4 kWh   (2) 4 kWh

   (3) 2 kWh   (4) 0·02 kWh

73. You are given the following electrical appliances :

   a. 1 kW, 250 V electric heater

   b. 1 kW, 250 V electric kettle

   c. 1 kW, 250 V electric bulb

   Which of the above has the highest resistance ?

   (1) Heater

   (2) Kettle

   (3) Bulb

   (4) All have equal resistance

74. The relationship between line and phase voltages and currents in star connected networks is given by

   (1) $V_{ph} = V_L, I_{ph} = \dfrac{I_L}{\sqrt{3}}$

   (2) $V_{ph} = \dfrac{V_L}{\sqrt{3}}, I_{ph} = \dfrac{I_L}{\sqrt{3}}$

   (3) $V_{ph} = V_L, I_{ph} = I_L$

   (4) $V_{ph} = \dfrac{V_L}{\sqrt{3}}, I_{ph} = I_L$

75. A balanced 3-phase 3-wire supply feeds balanced star connected resistors. If one of the resistors is disconnected, then the percentage reduction in the power consumption is

   (1) 33·33%   (2) 50%

   (3) 66·67%   (4) 75%

76. Which of the following sentences is/are true for R_L and R_C circuits ?

   a. Time constant is defined as the time required to charge 33% of full charge.

   b. Unit of time is second which is equal to ohm × farad = $\dfrac{henry}{ohm}$.

   c. Time constant is defined as the time required to charge 90% of full charge.

   d. Time constant is defined as the time required to charge 63·21% of full charge.

   Answer options :

   (1) Only a is true   (2) a and c are true

   (3) b and c are true   (4) b and d are true

77. When a circuit is represented by equivalent Thevenin's circuit and Norton's circuit

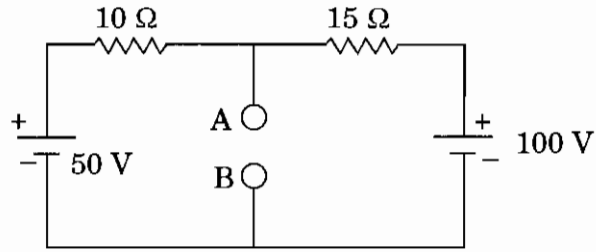   (1) Norton resistance < Thevenin resistance

   (2) Norton resistance = Thevenin resistance

   (3) Norton resistance > Thevenin resistance

   (4) Cannot comment

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78. The parameters of the Thevenin's equivalent circuit for the network shown below are

(1) $R_{TH} = 3\cdot75\ \Omega;\ V_{TH} = 62\cdot5\ V$

(2) $R_{TH} = 25\ \Omega;\ V_{TH} = 50\ V$

(3) $R_{TH} = 6\ \Omega;\ V_{TH} = 70\ V$

(4) $R_{TH} = 6\ \Omega;\ V_{TH} = 50\ V$

---

79. An air capacitor has two parallel plates 10 cm^2 in area and 0·5 cm apart. When a dielectric slab of area 10 cm^2 and thickness of 0·4 cm is inserted between the plates, one of the plates has to be moved by 0·4 cm to restore the capacitance. Then what is the dielectric constant of the slab ?

(1) 5   (2) 0·5

(3) 0·005   (4) 0·05

---

80. In the network shown in the figure given below C = 5 µf and R = 2 MΩ. The potential at P, at the instant of closing the switch S and 10 seconds after closing S will respectively be
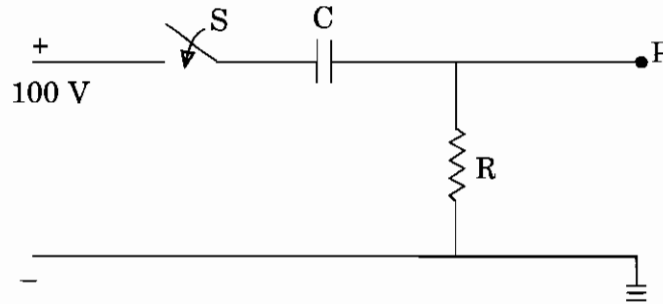

(1) 0 V and 63·2 V   (2) 100 V and 63·2 V

(3) 0 V and 36·8 V   (4) 100 V and 36·8 V

---

81. The term "permittivity" is associated with _____ and the term "permeability" is associated with _____ respectively.

(1) Electromagnetism, Electrostatic

(2) Electromagnetism, Electromagnetism

(3) Electrostatic, Electromagnetism

(4) Electrostatic, Electrostatic

---

82. Can a 50 Hz transformer be used for 25 Hz, if the input voltage is maintained constant at the rated value corresponding to 50 Hz ?

(1) Yes, since the voltage is constant, current level will not change.

(2) No, flux will be doubled, which will drive the wire to excessive saturation.

(3) No, owing to decreased resistance of transformer, input current will be doubled at the load.

(4) Yes, at constant voltage, insulation will not be overstressed.

---

83. A solenoid has 4000 turns over it with inductance of 0·126 H. The energy stored in the magnetic field, when a current of 2 A flows in the solenoid will be

(1) 0·252 J

(2) 8000 J

(3) 0·504 J

(4) 1008 J

---

84. For the parallel operation of single-phase transformers, it is necessary that they should have

(1) same efficiency

(2) same polarity

(3) same kVA rating

(4) same number of turns on the secondary side

---

85. Energy stored by a coil is doubled when its current is increased by

(1) 100%

(2) 50%

(3) 41·4%

(4) 25%

---

86. A three-phase transformer has its primary winding connected in delta and secondary winding in star. Secondary to primary turns ratio per phase is 5. For a primary voltage of 400 V (phase to phase), the secondary voltage (phase to phase) would be

(1) 80 V

(2) $80\sqrt{3}$ V

(3) 3464 V

(4) 2000 V

87. A short-circuit test on a transformer is usually performed with

(1) high voltage side short-circuited

(2) low voltage side short-circuited

(3) low voltage side open-circuited

(4) Low and high voltage side open-circuited

88. At 50 Hz operation, a single-phase transformer has hysteresis loss of 200 W and eddy current loss of 100 W. Its core loss at 60 Hz operation will be

(1) 432 W

(2) 408 W

(3) 384 W

(4) 360 W

89. For performing load test on three-phase transformer, primary and secondary windings are connected in

(1) Star and Delta respectively

(2) Star-Star respectively

(3) Delta-Star respectively

(4) Delta-Delta respectively

90. Two charges of equal magnitude are separated by some distance. If the charges are increased by 10%; to get the same force between them, their separation must be

(1) increased by 21%

(2) increased by 10%

(3) decreased by 10%

(4) None of the above

91. In a 4-pole, 25 kW, 200 V, wave wound DC shunt generator, the current in each parallel path will be

(1) 62·5 A　　　(2) 125 A　　　(3) 31·25 A　　　(4) 250 A

92. The speed of a DC shunt generator tends to decrease when load connected across it is increased. The probable reason is

(1) DC generator is normally designed to work at constant load and it cannot sustain any change in it.

(2) There is a counteracting torque generated in armature and it increases with load.

(3) Field winding receives less current and produces less flux

(4) All of the above

93. The speed of DC shunt motor can be increased above its rated speed by

(1) increasing the supply voltage within its rated value

(2) increasing the flux per pole

(3) decreasing the flux per pole

(4) connecting additional resistance in series of the armature

94. Most suitable motor for electric traction is

(1) DC series motor　　　　　(2) DC compound motor

(3) DC shunt motor　　　　　(4) None of the above

95. A DC series motor develops a torque of 20 Nm at 3 A of load current. If the current is increased to 6 A, the torque developed will be

(1) 10 Nm　　　(2) 20 Nm　　　(3) 80 Nm　　　(4) 40 Nm

96. In the figure shown below, the rotor is rotated by prime mover in clockwise direction. What will be the direction of emf or current induced in conductors A and B ?
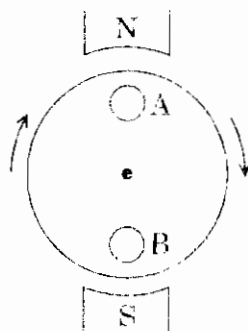
(1) A = $\odot$, B = $\otimes$　　　　　(2) A = $\odot$, B = $\odot$

(3) A = $\otimes$, B = $\odot$　　　　　(4) A = $\otimes$, B = $\otimes$

97. Which of the following speed control methods of DC motor requires auxiliary motor or a prime mover ?

    (1)   Flux control

    (2)   Armature control

    (3)   Voltage control

    (4)   Ward-Leonard control

98. Consider the following statements regarding the starting of a DC shunt motor :

    a.   External field resistance should be minimum.

    b.   External Field resistance should be maximum.

    c.   Reduced voltage should be applied to the armature.

    d.   Increased voltage should be applied to the armature.

    Which of the above statements are correct ?

    (1)   a and c are correct

    (2)   a and d are correct

    (3)   b and c are correct

    (4)   b and d are correct

99. In a DC machine, lap winding is used for

    (1)   Low voltage, low current generators

    (2)   Low voltage, high current generators

    (3)   High voltage, low current generators

    (4)   High voltage, high current generators

100. The back emf of a 220 V, 100 A separately excited DC motor is 221·65 V. If motor is to be braked by plugging, what should be the total armature circuit resistance to limit braking current to 200 A ?

    (Note : $E_b > V$, since motor is running at a higher speed than rated)

    (1)   Only armature winding resistance will be sufficient

    (2)   2·21 ohm

    (3)   0·00825 ohm

    (4)   0·0165 ohm

सूचना – (पृष्ठ 1 वरून पुढे.....)

(8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82'' यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

(9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वतःबरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. **मात्र परीक्षा कक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.**

नमुना प्रश्न

Pick out the correct word to fill in the blank :

Q. No. 201.   I congratulate you _____ your grand success.

(1)   for   (2)   at

(3)   on   (4)   about

ह्या प्रश्नाचे योग्य उत्तर "(3) on'' असे आहे. त्यामुळे या प्रश्नाचे उत्तर "(3)'' होईल. यास्तव खालीलप्रमाणे प्रश्न क्र. 201 समोरील उत्तर-क्रमांक "③'' हे वर्तुळ पूर्णपणे छायांकित करून दाखविणे आवश्यक आहे.

प्र. क्र. 201.   ①   ②   ●   ④

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तरक्रमांक हा तुम्हाला स्वतंत्रीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित वर्तुळ पूर्णपणे छायांकित करून दाखवावा. **ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.**

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