महाराष्ट्र अभियांत्रिकी सेवा (विद्युत) (मुख्य) परीक्षा - 2018
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प्रश्नपुस्तिका क्रमांक
BOOKLET No. 100173

2018

प्रश्नपुस्तिका-I **I12** संच क्र. **A**

विद्युत अभियांत्रिकी पेपर – 1

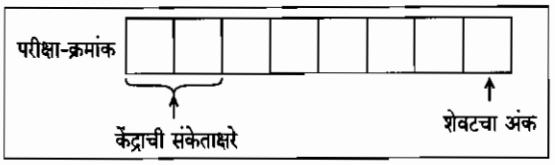
वेळ : 2 (दोन) तास

एकूण प्रश्न : 100
एकूण गुण : 200

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.



(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''.**

(8) (अ) प्रस्तुत परीक्षेसाठी Non-programmable Scientific calculator वापरण्यास परवानगी आहे.
(ब) उमेदवाराने परीक्षा कक्षात आणलेल्या calculator चा सिरीज क्रमांक हजेरीपटावर नमूद करावा.
(स) उमेदवाराने परीक्षेत programmable calculator वापरल्याचे आढळल्यास त्याची उमेदवारी रद्द करण्यात येईल.

ताकीद

ह्या प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपेपर्यंत ही प्रश्नपुस्तिका आयोगाची मालमत्ता असून ती परीक्षाकक्षात उमेदवाराला परीक्षेसाठी वापरण्यास देण्यात येत आहे. ही वेळ संपेपर्यंत सदर प्रश्नपुस्तिकेची प्रत/प्रती, किंवा सदर प्रश्नपुस्तिकेतील काही आशय कोणत्याही स्वरूपात प्रत्यक्ष वा अप्रत्यक्षपणे कोणत्याही व्यक्तीस पुरविणे, तसेच प्रसिद्ध करणे हा गुन्हा असून अशी कृती करणाऱ्या व्यक्तीवर शासनाने जारी केलेल्या ''परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचा अधिनियम-82'' यातील तरतुदीनुसार तसेच प्रचलित कायद्याच्या तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरूद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

1. The starting winding of a single phase motor is placed in the
   (1) Rotor (2) Stator (3) Armature (4) Field

2. The starting torque of a capacitor-start induction run motor is directly related to the angle α between its two windings current by the relation
   (1) $\cos \alpha$ (2) $\sin \alpha$ (3) $\tan \alpha$ (4) $\sin \frac{\alpha}{2}$

3. The shifting magnetic field in a shaded pole motor is developed by using
   (1) shading coils (2) salient poles
   (3) a capacitor (4) damper winding

4. Implementation of Volts/Hertz strategy for invertor-fed induction motor in open loop is used in
   (1) Low performance applications
   (2) High performance applications
   (3) Both (1) and (2)
   (4) None of the these

5. In V/F control of induction motors, the ratio of V/F is boosted during
   (1) below rated frequency (2) at half rated voltage
   (3) below 5 Hertz (4) above rated frequency

6. An under excited synchronous motor operates at
   (1) lagging PF
   (2) unity PF
   (3) leading PF
   (4) lagging PF at low loads and leading PF at high loads

7. Compared with a resistor split phase motor, a capacitor start motor has
   (1) Higher starting torque
   (2) Lower starting torque
   (3) Higher running torque
   (4) Lower running torque

8. The starting torque of a three-phase induction motor can be increased by increasing

(1) The rotor resistance (2) The rotor reactance

(3) The stator resistance (4) The stator reactance

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9. In Star-Delta starting of a squirrel cage large induction motor; compared with DOL, needs to be expanded, starting current and torque are reduced by factors of

(1) $\frac{1}{\sqrt{3}}, \frac{1}{3}$ (2) $\frac{1}{3}, \frac{1}{3}$

(3) $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$ (4) $\frac{1}{3}, \frac{1}{\sqrt{3}}$

---

10. A 50 Hz, 3-phase induction motor has a full load speed of 1440 rpm. The number of poles of the motor are

(1) 4 (2) 6 (3) 12 (4) 8

---

11. If the supply frequency of synchronous motor is 50 cycles/second, then the rotor must revolve at

(1) 25 cycles/second (2) 50 cycles/second

(3) 100 cycles/second (4) None of the above

---

12. In a synchronous motor,

(1) E is always less than V (2) E = V

(3) E is always more than V (4) E may be more or less than V

---

13. Power factor of a synchronous motor can be improved by

(1) Keeping load constant and running motor over-excited

(2) Keeping load constant and running motor under-excited

(3) varying the load and constant excitation

(4) None of the above

---

14. As the load on a synchronous motor increases, the torque angle

(1) increases (2) decreases

(3) remains the same (4) may increase or decrease

---

15. Damper winding is provided in synchronous motors to

(1) increase power factor (2) suppress hunting

(3) reduce speed (4) increase speed

16. The full load slip of synchronous motor is

(1) 5% (2) 1% (3) 2% (4) zero

17. Single phase synchronous motors are known as unexcited motors because

(1) They run at constant speed

(2) They do not need d.c. excitation

(3) They can operate on single phase supply only

(4) None of the above

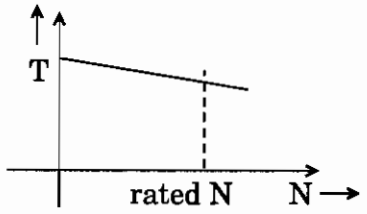
18. In a synchronous motor, the inverted V-curve represents the relation between

(1) field current and power factor (2) field current and armature current

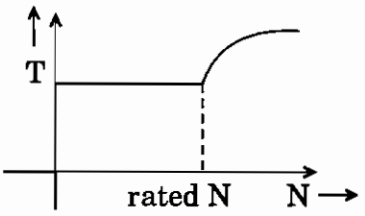
(3) armature current and power factor (4) None of the above

19. Torque-speed characteristics of synchronous motor operating with V/F control is given in the figure below :

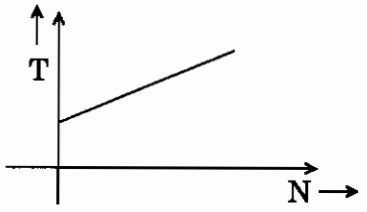
(1)



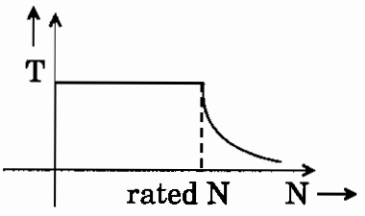
(2)



(3)



(4)



20. The pull-out torque of a salient pole synchronous motor occurs when the torque angle is about

(1) 0° (2) 90° (3) 30° (4) 75°

21. Which of the following operations is commutative but ***not*** associative ?
(1) AND (2) OR (3) EX-OR (4) NAND

22. The minimum number of resistors required in a 4-bit D/A network of weighted-resistor type is
(1) 4 (2) 8 (3) 15 (4) 16

23. The speed of conversion is maximum in
(1) Successive approximation A/D converter
(2) Parallel-comparator A/D converter
(3) Counter-ramp A/D converter
(4) Dual-slope A/D converter

24. A multiplexer is a
(1) combinational circuit (2) flip-flop
(3) sequential circuit (4) comparator

25. When a flip-flop is reset its output will be
(1) $Q = 0, \bar{Q} = 0$ (2) $Q = 1, \bar{Q} = 1$
(3) $Q = 0, \bar{Q} = 1$ (4) $Q = 1, \bar{Q} = 0$

26. In a master slave JK-flip-flop J = K = 1. The state Q_{n+1} of the flip-flop after the clock pulse will be
(1) 0 (2) 1 (3) Q_n (4) $\bar{Q}_n$

27. An ideal operational amplifier has
(1) Infinite output impedance (2) Zero input impedance
(3) Infinite bandwidth (4) All of the above

28. When is differential amplifier used as inverting amplifier ?
(1) The output and non-inverting terminal are connected together.
(2) The output and inverting terminal are connected together.
(3) The non-inverting input terminal is grounded.
(4) None of the above

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

29. In the phase-shift oscillator, the operating frequency is determined by
(1) Resistance only (2) Capacitance only
(3) LC combinations (4) RC combinations

30. What logic function is produced by adding inverters to the inputs of an AND gate ?
(1) OR (2) NOR (3) NAND (4) X-OR

31. The ratio of transformation in the case of potential transformers
(1) increases with increase in power factor of secondary burden
(2) remains constant irrespective of the power factor of secondary burden
(3) decreases with increase in power factor of secondary burden
(4) None of the above

32. When is the secondary winding of a current transformer open-circuited with the primary winding energized ?
(1) The whole of the primary current produces large value of flux in the core thereby producing a large voltage in secondary winding.
(2) The large voltage may act as safety hazard for the operators and may even rupture the insulation.
(3) The large magnetizing current is taken off, it leaves a large value of residual magnetism.
(4) All of the above

33. In strain gauge bridge configuration for measurement of torque, the strain gauge must be precisely mounted at
(1) 0° with the shaft axis (2) 45° with the shaft axis
(3) 90° with the shaft axis (4) 60° with the shaft axis

34. A thermocouple has low response time when
(1) bare used (2) thin sheathed used
(3) Both (1) and (2) (4) None of the above

35. A Reynolds number of 1000 indicates
(1) Turbulent flow
(2) Laminar flow
(3) A flow which can either be turbulent or laminar
(4) None of the above

36. Type 1 system means that open-loop transfer function has a number of integrations equal to

(1) Zero (2) One (3) Two (4) None of the above

---

37. The stability of a system which approaches the origin as time tends to infinity is termed as

(1) asymptotically stable (2) limitedly stable

(3) oscillating in nature (4) None of the above

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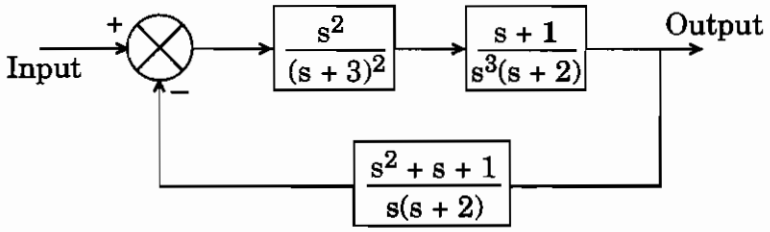
38. The system shown below is



(1) a type 0 system (2) a type 1 system

(3) a type 2 system (4) None of the above

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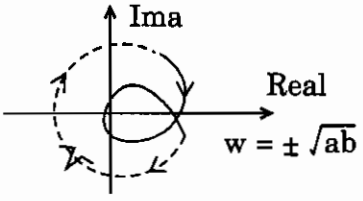
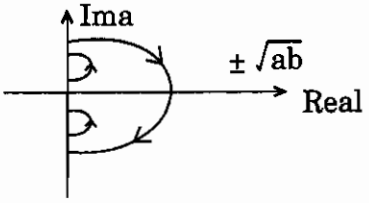
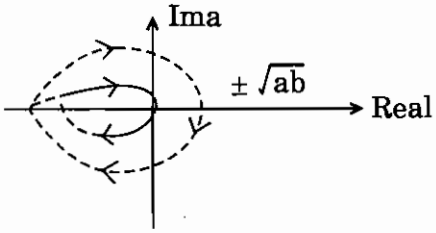
39. The Nyquist stability plot for $GH = \frac{s-a}{s(s+b)}$, a, b > 0 will be

(1)


(2)


(3)


(4) None of the above

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40. The following quadratic form

$$W(X) = 10X_i^2 + 4X_2^2 + X_3^2 + 2X_1X_2 - 2X_2X_3 - 4X_1X_3$$

(1) is positive definite (2) is negative definite

(3) is negative semi-definite (4) None of the above

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

41. Presence of Gold in thyristors

(1) reduces minority carrier life time and increases leakage current

(2) reduces minority carrier life time and reduces leakage current

(3) increases minority current life time and reduces leakage current

(4) increases minority current life time and increases leakage current

---

42. Thyristor control adopted for ac applications use the following triggering method in the most common way.

(1) Pulse gate triggering (2) AC gate triggering

(3) Thermal triggering (4) Radiation triggering

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43. If R_E = 1 kΩ and I_V = 5 mA, determine the value of V_{EE} which will cause the UJT to turn "off".

(1) 5 V (2) 2 V

(3) 7 V (4) 6 V

---

44. Following is the demerit of IGBT :

(1) High peak current capability (2) Low turn off time

(3) Ease of gate drive (4) High turn off time

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45. Multiple quadrant operation Luo converters are second generator converters, they have three modes

(1) Two quadrant in forward operation.
Two quadrant in reverse operation.
Four quadrant in dc/dc Luo converter.

(2) Four quadrant in forward operation.
Two quadrant in reverse operation.
Two quadrant in dc/dc Luo converter.

(3) Two quadrant in forward operation.
Four quadrant in reverse operation.
Four quadrant in dc/dc Luo converter.

(4) Four quadrant in forward operation.
Four quadrant in reverse operation.
Four quadrant in dc/dc Luo converter.

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46. Inversion failure in naturally commutated circuits used for motor loads leads to

(1) High voltage across thyristor

(2) High fault current

(3) Low power factor

(4) Low fault current

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47. The maximum d.c. voltage available from a fully controlled bridge converter supplying a motor and operating from low impedance 230 V mains is

(1) 230 V (2) 210 V (3) 207 V (4) 180 V

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48. Speed reversal of d.c. series motor can be achieved by

(1) Reversing the field winding

(2) Reversing field and armature winding simultaneously

(3) Varying voltage magnitude

(4) Disconnecting the armature supply

---

49. According to Betz theory, the maximum possible power coefficient is 16/27 and 59% efficiency is the best conventional wind turbine can do in extracting power from the wind because

a. 100% efficiency is not possible due to fluid mechanics of wind.

b. 100% efficiency can be extracted then the flow of air would be reduced to complete stop and no velocity would remain available to sustain flow through extraction mechanism.

Answer Options :

(1) a is true, b is false (2) Both a and b are true

(3) a is false, b is true (4) Both a and b are false

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50. The operation of the cascade connection of slip-ring induction motor is regarded as

(1) Speed control by emf injection in rotor circuit

(2) Speed control by current injection

(3) Speed control by rotor resistance

(4) Speed control by gear mechanism

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51. Which of the following statements are true for renewable energy ?

a. Energy obtained from natural and persistent flow of energy occurring in the immediate environment.

b. The renewable energy is obtained from static stores of energy that remain underground unless released by human interaction.

c. It is also called as Green energy or Sustainable energy.

d. It is the energy supplied by finite supplies or Brown energy.

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

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52. Comment on the speed of generators of Chandrapur Super Thermal Power Station and Koyana Hydro Power Station.

(1) Same speed of both power station generators
(2) Chandrapur Super Thermal Power Station generator speed is higher
(3) Koyana Hydro Power Station speed is higher
(4) Cannot comment

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53. Electrostatic precipitators are used in

(1) Thermal power station to reduce the pollution
(2) Thermal power station to heat the water
(3) Solar power plant to generate static electricity
(4) Nuclear power plant to control radiation

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54. Corona effect is observed in

(1) Underground cables
(2) Underwater cables
(3) Overhead distribution lines
(4) Overhead EHV transmission lines

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55. As compared to single conductor, the bundled conductor transmission lines have

(1) Lower values of surge impedance
(2) Higher values of surge impedance
(3) Zero surge impedance
(4) Infinite surge impedance

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56. Per unit impedances of transformer, measured from primary side and secondary side are

(1) equal
(2) depends on transformer ratio
(3) depends on rating on transformer
(4) depends on polarity of windings

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57. During day time, solar cells generate,

(1) constant D.C. voltage (2) variable D.C. voltage
(3) constant A.C. voltage (4) variable A.C. voltage

---

58. Operation of following wind turbine is independent of wind direction.

(1) Horizontal axis turbine
(2) Vertical axis turbine
(3) Angular horizontal axis turbine
(4) None of the options available

---

59. In steam turbine plant, extraction of heat from flue gases to heat feed water of the boiler is done by

(1) Air preheater (2) Superheater
(3) Economiser (4) Condenser

---

60. Which of the following sentences is ***true*** for transmission line sequence impedances ?

(1) Positive sequence and negative sequence impedances are same
(2) Positive sequence and zero sequence impedances are same
(3) Negative sequence and zero sequence impedances are same
(4) All the sequence impedances are same

---

61. The following factors are affecting SAG in overhead lines :

a. The SAG is inversely proportional to the weight of the conductor.
b. The SAG is directly proportional to the span length.
c. The SAG is directly proportional to the working tensile strength of the conductor at constant temperature.
d. The SAG increases with increase in temperature.

From the above statements, which are *incorrect* ?

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

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62. An overhead transmission line has a span of 220 metres, conductor weighing 804 kg/km. Calculate the maximum SAG if the ultimate tensile strength of the conductor is 5758 kg. Assume safety factor as 2. Also find maximum tension T.

(1) SAG = 1·69 T = 2879 kg

(2) SAG = 2 T = 2800 kg

(3) SAG = 2·21 T = 2875 kg

(4) SAG = 1·89 T = 2789 kg

---

63. A power station's maximum demand is 50 MW, capacity factor is 0·6 and utilization factor is 0·85. Calculate the following :

a. Load factor

b. Annual energy produced

(1) Load factor : 0·5068
Annual energy : $0{\cdot}3 \times 10^6$ MWh

(2) Load factor : 0·7058
Annual energy : $0{\cdot}3 \times 10^7$ MWh

(3) Load factor : 0·5068
Annual energy : $0{\cdot}3 \times 10^7$ MWh

(4) Load factor : 0·7058
Annual energy : $0{\cdot}3 \times 10^6$ MWh

---

64. Transient stability of the generator is dependent on

a. generator reactance; lower reactance decreases peak power and increases initial rotor angle.

b. how heavily the generator is loaded.

c. generator inertia; higher the inertia, slower the rate of the change of angle.

d. generator output during fault

Which of the above is *incorrect* ?

(1) a

(2) b

(3) c

(4) None of the above

---

65. In active power and frequency control,

a. frequency should remain constant.

b. considerable drop in frequency could result in low magnetising currents in induction motor and transformers.

c. the frequency of a system is dependent on reactive power balance.

d. relatively closed control of frequency ensures constancy of speed of induction motors.

Which of the above statements are *incorrect* ?

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

---

66. Voltage control bus or P-V bus is that bus where

(1) only voltage control equipments are connented

(2) only generator is connected

(3) only frequency controllers are connected

(4) generator or voltage control equipments are connented

---

67. In Gauss-Seidel's method of power flow solution, the acceleration factor is used for

(1) Reducing the number of iterations (2) Increasing the number of iterations

(3) One step solution in one iteration (4) Easy back substitution of voltages

---

68. The reactive power supply capability of an alternator is determined by

(1) kVA rating of alternator (2) short circuit ratio of alternator

(3) limits of the generator governor (4) voltage rating of the alternator

---

69. Ferranti effect in long transmission lines is due to the effect of

(1) Line reactance (2) Line capacitance

(3) Line resistance (4) None of the above

---

70. Symmetrical fault currents are restricted by

(1) System impedance (2) System voltage profile

(3) System power rating (4) D.C. component of fault current

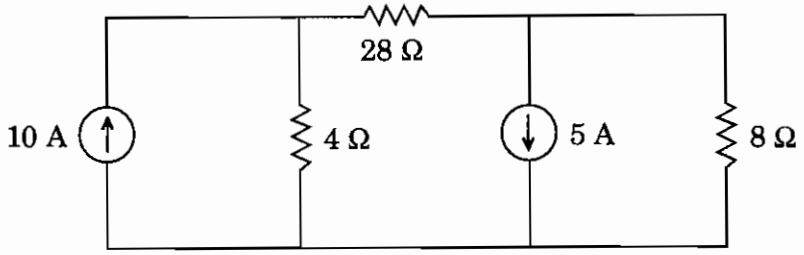
---

71. While measuring power in a three-phase load by two-wattmeter method, the reading of the two wattmeters will be equal and opposite when

(1) power factor is unity (2) load is balanced

(3) phase angle is between 60° and 90° (4) the load is purely inductive

72. In the current shown in the figure below, the current I will be



(1) 1 A (2) 2 A (3) 4 A (4) 8 A

73. In a R-L-C series circuit, R = 10 Ω, L = 1 H and C = 1 μF. It is connected to 230 V a.c. source of variable frequency. When the frequency is set to zero, circuit current will be

(1) 23 A (2) 11·5 A (3) 46 A (4) zero

74. The average value of the positive half of the sine wave current having peak value of I_m will be

(1) $I_m/\sqrt{2}$ (2) $I_m/1{\cdot}11$ (3) $I_m/2\pi$ (4) I_m/π

75. At resonance

(1) pf is better in R-L-C series circuit than R-L-C parallel circuit

(2) pf is leading in R-L-C series circuit and lagging in R-L-C parallel circuit

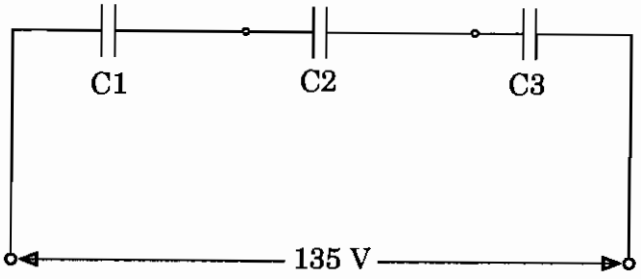
(3) pf is leading in R-L-C parallel circuit and lagging in R-L-C series circuit

(4) pf is unity in R-L-C series as well as R-L-C parallel circuits

76. Two heaters A and B are connected in parallel across supply voltage V. Heater A produces 500 kcal in 20 minutes and B produces 1000 kcal in 10 minutes. The resistance of A is 10 Ω. The resistance of B is

(1) 0·25 Ω (2) 5 Ω (3) 2·5 Ω (4) 0·5 Ω

77. If the charge on each of the capacitors in the given figure is 4500 μC, what is the total capacitance in μF ?



(1) 325 (2) 11·1 (3) 22·2 (4) 33·3

78. A 100 watt light bulb burns on an average of 10 hours a day for one week. The weekly consumption of energy will be _____ units.

(1) 7 (2) 70 (3) 0·7 (4) 0·07

79. Three impedances are connected in delta, Phase I and II with $R_1 - jX_L$, phase III with $R_3 + jX_C$. $R_1 = R_2 = R_3$ and $|X_L| = |X_C|$. This load is

(1) balanced

(2) balanced or unbalanced, depending on frequency of supply

(3) unbalanced

(4) neither balanced nor unbalanced

80. Apparent power in three-phase star connected balanced load is given by

(1) $\sqrt{3}\ V_L I_L$ (2) $\sqrt{3}\ V_L I_L \cos\phi$

(3) $\sqrt{3}\ V_L I_L \sin\phi$ (4) None of the above

81. If a 220/440 V, 50 Hz, single phase transformer is operated on 220 V, 40 Hz supply then

(1) the eddy current loss and hysteresis loss of the transformer will decrease.

(2) the eddy current loss and hysteresis loss of the transformer will increase.

(3) the hysteresis loss of the transformer increases while eddy current loss remains the same.

(4) the hysteresis loss remains the same, whereas eddy current loss decreases.

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82. A transformer possesses a percentage resistance and percentage reactance of 1% and 4% respectively. Its voltage regulation and power factor 0·8 lagging and 0·8 leading would be

(1) 2·4 % and – 0·8%

(2) 3·2 % and – 1·6%

(3) 3·2 % and – 3·2%

(4) 4·8 % and – 1·6%

---

83. The terms 'up' and 'down' are associated with

(1) cooling of the transformer

(2) efficiency of the transformer

(3) installation of the transformer

(4) regulation of the transformer

---

84. During short-circuit test on a small transformer, the frequency (of applied voltage) is increased from 50 Hz to 200 Hz. The copper losses will increase by the factor of

(1) 16 (2) 4 (3) 1 (4) $\frac{1}{4}$

---

85. Two components of no load current of single phase transformer are I_w = 0·4 A and I_m = 1·44 A. Its no load power factor will be

(1) $\cos\left(\frac{0{\cdot}4}{1{\cdot}44}\right)$

(2) $\cos\left[\frac{0{\cdot}4}{\sqrt{1{\cdot}44^2 - 0{\cdot}4^2}}\right]$

(3) $\cos\left[\frac{0{\cdot}4}{\sqrt{1{\cdot}44^2 + 0{\cdot}4^2}}\right]$

(4) None the the above

---

86. In which of the following cases, will the same transformer have highest efficiency ?

(1) Supplying rated load at 0·8 pf lagging.

(2) Supplying rated load at 0·8 pf leading.

(3) Supplying rated load at unity pf.

(4) Supplying 10% overload (110% of rated) at 0·8 pf lagging.

---

87. In magnetic circuits, due to fringing effect, the following is true if B_c represents core flux density and B_g represents average air gap flux density.

(1) $B_c = B_g$

(2) $B_c > B_g$

(3) $B_c < B_g$

(4) B_g remains unaffected due to fringing

---

88. For magnetic circuits, the relationship which is similar to application of Ohm's Law is, (where ϕ is flux, S is reluctance)

(1) $\phi = \frac{S}{mmf}$ (2) $mmf = \frac{\phi}{S}$

(3) $\phi = \frac{mmf}{S}$ (4) None of the above

---

89. A coil of 0·5 H carries a current of 1 A. If the current is reversed in 1 millisecond, emf induced in the coil is

(1) 500 V (2) 100 V (3) 1000 V (4) 5000 V

---

90. A coil of 1000 turns is wound on a core. A current of 1 A flowing through the coil creates a core flux of 1 mWb. The energy stored in the magnetic field is

(1) 0·25 J (2) 0·5 J (3) 1 J (4) 2 J

---

91. A lap wound dc machine has 400 conductors and 8 poles. The voltage induced per conductor is 2 V. The machine generates a voltage of

(1) 200 V (2) 400 V (3) 100 V (4) 800 V

---

92. A generator delivers 210 V on no load and 200 V on full load. The voltage regulation of the d.c. generator is

(1) 95% (2) 5% (3) 10% (4) 4·76%

---

93. The type of d.c. generator used for arc welding purpose is a

(1) series generator

(2) shunt generator

(3) cumulative compounded generator

(4) differentially compounded generator

---

94. If the applied voltage to a d.c. machine is 230 V, then the back emf for maximum power developed is

(1) 200 V (2) 230 V (3) 115 V (4) 460 V

95. A 220 V d.c. machine has an armature resistance of 1 ohm. If the full load current is 20 A (neglect field current), the difference in the induced voltages when the machine is running as a motor and as a generator is

(1) 20 V (2) zero (3) 40 V (4) 50 V

96. In electric machines, the process of electromechanical energy conversion is

(1) a reversible one (2) not reversible

(3) lossless (4) without mechanical motion

97. In a d.c. machine,

(1) field windings are on rotor and armature windings are on stator

(2) field windings are on stator and armature windings are on rotor

(3) field windings are on rotor and instead of armature windings, commutator windings exist

(4) distributed field windings are on rotor

98. Induced emf in d.c. generator is directly proportional to

(1) armature speed (2) number of machine poles

(3) flux per pole (4) All the above

99. The field winding of a d.c. shunt machine has

(1) current excitation (2) voltage excitation

(3) Both (1) and (2) (4) separate excitation

100. The speed of a d.c. shunt motor for a given load can be controlled by

(1) adjusting field current

(2) controlling armature voltage

(3) adjusting resistance included in the armature circuit

(4) All the above methods

सूचना - (पृष्ठ 1 वरून पुढे.....)

(9) 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.

(10) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वत:बरोबर 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 स्वतंत्ररीत्या 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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