प्रवक्ता (तकनीकी शिक्षा विभाग) प्रतियोगी परीक्षा, 2020

परीक्षा दिनांक :– 16-3-2021 समय :– 9:00AM-12:00 Noon

पुस्तिका म पृष्ठा का सख्या : 24
Number of Pages in Booklet : 24

प्रश्न-पत्र पुस्तिका सख्या /
Question Paper Booklet No. 7425013

25/3/21

पुस्तिका में प्रश्नों की संख्या : 150
No. of Questions in Booklet : 150

Paper Code : 07
Sub: Electrical Engg.

LTE-12

Paper - I

समय : 3.00 घण्टे
Time : 3.00 Hours

अधिकतम अंक : 75
Maximum Marks : 75

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

1. **सभी** प्रश्नों के उत्तर दीजिए ।
2. **सभी** प्रश्नों के अंक समान हैं ।
3. प्रत्येक प्रश्न का केवल **एक** ही उत्तर दीजिए ।
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा ।
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 ।
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 ।
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 ।
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 ।
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 ।

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 ।

INSTRUCTIONS FOR CANDIDATES

1. Answer **all** questions.
2. **All** questions carry equal marks.
3. Only **one** answer is to be given for each question.
4. If more than one answers are marked, it would be treated as wrong answer.
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. 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. **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. 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. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.

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.

07-□

1. Which of the following is zero ?

(1) grad div A

(2) div gradient V

(3) div curl A

(4) curl curl A

2. The electrix flux density is given $D = (2y^2 + z)\ I_x + 4xy\ I_y + xI_z\ c/m^2$. The volume charge density at point (–1, 0, 3) is

(1) 0 c/m^3

(2) –2 c/m^3

(3) –4 c/m^3

(4) –8 c/m^3

3. The work done by a force $F = 4I_x - 3I_y + 2I_z$ m in giving a 1 n C charge a displacement of $10\ I_x + 2I_y - 7\ I_Z$ m is

(1) 103 n J

(2) 60 n J

(3) 40 n J

(4) 20 n J

4. If a vector field P is solenoidal, which of this is true ?

(1) $\oint_S P.ds = 0$

(2) $\oint_l P.dl = 0$

(3) $\nabla \times P = 0$

(4) $\nabla \times P \neq 0$

5. The boundary condition valid at the boundary between two dielectrics 1 and 2 is

(1) $E_{t1} = E_{t2}$

(2) $E_1 = E_2$

(3) $Dn_1 = Dn_2$

(4) both (1) and (3)

6. The magnetic field at any point on the axis of a current carrying circular coil will be

(1) perpendicular to the axis

(2) parallel to the axis

(3) at an angle 45° with the axis

(4) zero

7. Which of these statements is not characteristic of a static magnetic field ?

(1) It is conservative

(2) It is solenoidal

(3) It has no sink or sources

(4) Magnetic flux lines are always closed

8. A potential field is given by

$V = 3x^2y - yz$. The electric field at p(2, –1, 4) is shall be

(1) $12\ I_x - 8\ I_y$ V/m

(2) $12\ I_x - I_z$ V/m

(3) $12\ I_x + 8\ I_y + I_z$ V/m

(4) $12\ I_x - 8\ I_y - I_z$ V/m

9. Given that $H = 10e^{-0.2x} \sin(10^6t - 3x)$ I_z A/m and the following statements are made :

(a) $\alpha = 0.2$ Np/m

(b) $\beta = -3$ rad/m

(c) $\omega = 10^6$ rad/s

(d) The wave travel along I_x

(e) The period of wave is 1 μs

(f) The wave is polarized in z direction

Which of these statements are incorrect ?

(1) a and e

(2) b and e

(3) c and f

(4) e and f

10. In free space

$H(z, t) = 0.10 \cos(4 \times 10^7 t - \beta_z) I_x$ A/m.

The expression for E (z, t) will be

(1) $E(z, t) = 37.7 \cos(4 \times 10^7 t - \beta z) I_y$

(2) $E(z, t) = 2.65 \times 10^{-4} \cos(4 \times 10^7 t - \beta_z) I_z$

(3) $E(z, t) = 37.7 \cos(4 \times 10^7 t - \beta_z) I_x$

(4) $E(z, t) = -37.7 \cos(4 \times 10^7 t - \beta_z) I_y$

11. Plane y = 0 carries a uniform current density 30 I_z mA/m. At (1, 20, –2) the magnetic field intensity is

(1) $-15 I_x$ mA/m

(2) $15 I_x$ mA/m

(3) $18.85 I_y$ mA/m

(4) $25 I_x$ mA/m

12. The velocity of a plane wave in a loss less medium having a relative permittivity of 4 and relative permeability of unity would be

(1) 1.5×10^8 m/s

(2) 2.5×10^8 m/s

(3) 1×10^8 m/s

(4) 2×10^8 m/s

13. The energy stored in a magnetic field is given by

(1) $\frac{H^2}{2\mu}$

(2) $\frac{\mu H^2}{2}$

(3) $\frac{\mu H}{2}$

(4) None of these

14. The unit of $\nabla \times \overline{H}$ is

(1) Ampere

(2) Ampere/Meter

(3) Ampere/Meter^2

(4) Ampere–Meter

15. Poynting's vector gives

(1) rate of energy flow

(2) intensity of electric field

(3) intensity of magnetic field

(4) direction of polarization

16. When a magnetic flux cuts across 200 turns at the rate of 2 wb/s, the induced voltage is

(1) 400 V

(2) 100 V

(3) 600 V

(4) 0 V

17. The concept of displacement current is a major contribution attributed to

(1) Lenz

(2) Maxwell

(3) Faraday

(4) Lorentz

18. What is the value of total electric flux coming out of a closed surface ?

(1) Zero

(2) Equal to the total charge enclosed by the surface

(3) Equal to volume charge density

(4) Equal to the surface charge density

19. The differential form of Faraday's law is –

(1) $\nabla \times B = \frac{\partial E}{\partial t}$

(2) $\nabla \times B = -\frac{\partial E}{\partial t}$

(3) $\nabla \times E = \frac{\partial B}{\partial t}$

(4) $\nabla \times E = -\frac{\partial B}{\partial t}$

20. A material is most stable when its potential energy is

(1) Maximum

(2) Infinite

(3) Minimum

(4) Zero

21. In general, the effect of temperature on relative permittivity of a material is to

(1) Reduce it

(2) Increase it

(3) Maintain it

(4) All of these

22. Match List – I (Engineering Materials) with List – II (Uses) and select the correct answer using the codes given below the lists :

List – I (Engineering Materials)	List – II (Uses)
A. Ferrous metals	a. Semiconductors making
B. Non-ferrous metals	b. Conductors in HV transmission
C. Ceramics	c. Alloy making
D. Metal-Metal composites	d. Refractories

Codes :

	A	B	C	D
(1)	c	a	b	d
(2)	c	a	d	b
(3)	a	b	d	c
(4)	b	d	c	a

23. Among the common dielectric materials, the highest dielectric strength is possessed by

(1) Transformer oil

(2) Mica

(3) PVC

(4) Polyethylene

24. The amplitude of the electric field intensity on the surface of a good conductor is E_0. The amplitude of the field at a depth equal to the skin depth is

(1) Zero

(2) $0.368\ E_0$

(3) $0.736\ E_0$

(4) $0.5\ E_0$

25. Ferrites have

(1) low copper loss

(2) low eddy current loss

(3) low resistivity

(4) high specific gravity compared to iron

26. A good insulating material should have

(1) high dielectric strength but low dielectric constant.

(2) high dielectric strength and dielectric constant.

(3) low dielectric strength and dielectric constant.

(4) low dielectric strength but high dielectric constant.

27. Consider the following statements associated with various magnetic materials :

a. A diamagnetic material obey Curie's law.

b. Susceptibility of a paramagnetic material is directly proportional to temperature.

c. A ferromagnetic material is freely repelled by a magnet.

d. Anti-ferromagnetic materials have small permanent dipole moment.

Which of the statement(s) given above is/are correct ?

(1) a only

(2) c and d only

(3) b only

(4) None of these

28. The temperature of the anti-ferromagnetic-to-paramagnetic transition is called

(1) Antiferromagnetic Curie temperature

(2) Curie-Weiss temperature

(3) Neel temperature

(4) Debye temperature

29. The polarization P in a solid dielectric is related to the electric field E and the electric flux density D by the relation

(1) $E = \varepsilon_0 D + P$

(2) $D = E + \varepsilon_0 P$

(3) $D = \varepsilon_0 E + P$

(4) $D = \varepsilon_0 (E + P)$

30. Magnetic susceptibility is

(1) inversely proportional to both temperature and magnetizing field.

(2) inversely proportional to temperature but independent of magnetizing field.

(3) proportional to temperature but inversely proportional to magnetizing field.

(4) proportional to temperature but independent of magnetizing field.

31. Magnetostriction is a phenomenon which occurs in

(1) paramagnetic materials

(2) antiferromagnetic materials

(3) ferrimagnetic materials

(4) ferromagnetic materials

32. The magnetic permeability is maximum for

(1) paramagnetic materials

(2) ferromagnetic materials

(3) diamagnetic materials

(4) None of these

33. The material used to make strong magnets for Magnetic Resonance Imaging (MRI) machines is –

(1) hard steel

(2) soft iron

(3) insulators

(4) superconductors

34. A good conductor should have

a. high electrical conductivity

b. low thermal conductivity

c. low melting point

d. good oxidation resistance

Of these, the correct statements are

(1) a, b, c and d

(2) a and d

(3) b, c and d

(4) a, c and d

35. In an integrated circuit, the SiO_2 layer provides

(1) Electrical connection to external circuit

(2) Physical strength

(3) Isolation

(4) Conducting path

36. When an electrical potential is applied to a piezo-electric material body, it –

(1) produces magnetic flux

(2) produces heat only

(3) changes shape of body

(4) produces electric field

37. The magnetization of a superconductor is

(1) 0

(2) – B

(3) – 1

(4) – H

38. Loss in a dielectric may occur due to

(1) Polarization

(2) Conductivity

(3) Ionization

(4) Any of these

39. The direction of induced voltage in a conductor can be changed by

(1) Increasing the field strength

(2) Reversing the field direction

(3) Increasing conductor length

(4) Decreasing conductor size

40. Which of the following statements are true about piezoelectric crystal ?

a. Their crystal structure possesses a centre of symmetry.

b. They always exhibit ferroelectricity.

c. They are necessarily poor electrical conductors.

d. They exhibit a relative permittivity less than unity.

Select the correct answer using the codes given in the options :

(1) a, b and d

(2) b, c and d

(3) a and c

(4) a, b and c

41. Lap winding is suitable for _____ current, _____ voltage d.c. generators.

(1) high, low

(2) low, high

(3) low, low

(4) high, high

42. The sole purpose of a commutator in a d.c. generator is to

(1) increase output voltage

(2) reduce sparking at brushes

(3) provide smoother output

(4) convert the induced a.c. into d.c.

43. The primary reason for providing compensating windings in a d.c. generator is to

(1) compensate for decrease in main flux

(2) neutralize armature mmf

(3) neutralize cross-magnetizing flux

(4) maintain uniform flux distribution

44. The critical resistance of the d.c. generator is the resistance of

(1) armature

(2) field

(3) load

(4) brushes

45. The d.c. series motor should never be switched on at no load because

(1) The field current is zero

(2) The machine does not pick up

(3) The speed becomes dangerously high

(4) It will take too long to accelerate

46. A 6 pole generator has a lap wound with 40 slots with 20 conductors per slot. The flux per pole is 25 mwb. Calculate the speed at which the machine must be driven to generate an emf of 300 V.

(1) 900 rev/min

(2) 450 rev/min

(3) 1800 rev/min

(4) 1000 rev/min

47. The normal value of the armature resistance of a d.c. motor is

(1) 0.005

(2) 0.5

(3) 10

(4) 100

48. A synchronous motor is operating on no-load at unity power factor. If the field current is increased, the pf will become

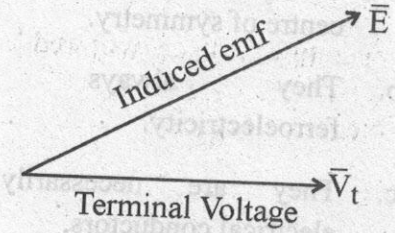
(1) leading and the current will increase.

(2) lagging and the current will decrease.

(3) leading and the current will decrease.

(4) lagging and the current will increase.

49. The phasor diagram of a synchronous machine connected to an infinite bus is shown below. The machine is acting as a



(1) generator and operating at a lagging p.f.

(2) generator and operating at a leading p.f.

(3) motor and operating at a leading p.f.

(4) motor and operating at a lagging p.f.

50. The relative speed between the magnetic fields of stator and rotor under steady state operation is zero for

(1) a d.c. machine

(2) an induction machine

(3) a synchronous machine

(4) all of these machines

51. When an alternator designed for operation at 60Hz is operated at 50 Hz,

(1) operating voltage will increase in the ratio of 1/2.

(2) operating voltage will reduce in the ratio of 8/6.

(3) kVA rating will increase in the ratio of 1/2.

(4) operating voltage will reduce in the ratio of $\left(\frac{5}{6}\right)^2$

52. When a 3-phase synchronous motor is running above synchronous speed, the damper winding produces

(1) reluctance torque

(2) damping torque

(3) induction motor torque

(4) induction generator torque

53. Synchronous generator is said to be overexcited when it operate at

(1) Leading power factor

(2) Unity power factor

(3) Lagging power factor

(4) Lagging to leading power factor

54. A rotating electromechanical energy conversion device has uniform air-gap. If δ is the space angle between the axis of stator field and rotor field, then the average torque developed is proportional to (a and b are constants)

(1) $a \sin \delta + b \sin 2\delta$

(2) $a \sin \delta$

(3) $a \sin 2\delta$

(4) δ

55. A star-connected synchronous motor rated 187 kVA, 3-ϕ, 2300V, 47A, 50 Hz, 187.5 rpm has an effective resistance of 1.5 Ω/phase and a synchronous reactance of 20 Ω per phase. What is the internal power developed by the motor when it is operating at rated current and 0.8 power factor leading ?

(1) 100 kW

(2) 125 kW

(3) 140 kW

(4) 155 kW

56. A 6-pole machine is rotating at a speed of 1200 rpm. This speed in electrical radians per sec and mechanical radian per sec are respectively given by

(1) $60\pi, 20\pi$

(2) $\frac{40\pi}{3}, 40\pi$

(3) $40\pi, 120\pi$

(4) $120\pi, 40\pi$

57. A synchronous machine has full-pitch coils having coil-span of 12 slots. For eliminating third harmonic, the coil-span should be

(1) 10 slots

(2) 9 slots

(3) 8 slots

(4) 6 slots

58. Armature winding is one in which working

(1) flux is produced by the working emf

(2) emf is produced by the working flux

(3) flux is produced by field current

(4) emf is produced by the leakage flux

59. The magnetizing current drawn by transformers and induction motors is the cause of their _____ power factor.

(1) zero

(2) unity

(3) lagging

(4) leading

60. A single phase reluctance motor

(1) has salient pole rotor structure and runs at super-synchronous speed.

(2) has salient pole rotor structure and runs at sub-synchronous speed.

(3) has salient pole rotor structure and runs at synchronous speed.

(4) has non-salient pole rotor structure and runs at synchronous speed.

61. Match List-I (Power losses) with List-II (Dependent upon) and select the correct answer using the codes given below the lists :

List – I	List – II
A. Stray load loss	a. Load
B. Brush constant loss	b. Value of flux
C. Hysteresis loss	c. Rotor rotation
D. No-load rotational loss	d. Square of load

Codes :

	A	B	C	D
(1)	c	a	d	b
(2)	d	a	b	c
(3)	c	d	b	a
(4)	d	a	c	b

62. A single phase induction motor is

(1) self starting

(2) not self starting

(3) self starting with the help of an auxiliary winding

(4) None of these

63. Which of the following statements associated with an ac series motor is incorrect ?

(1) Its torque-speed characteristic is similar to that of a dc series motor.

(2) Its torque-speed characteristic is similar to that of a dc shunt motor.

(3) Its power factor decreases with the increase in load torque.

(4) Its speed fails with the increase in load torque.

64. A single phase induction motor is running at N rpm. Its synchronous speed is Ns. If its slip w.r.t. forward field is S. What is the slip w.r.t. the backward field ?

(1) $-S$

(2) $(1-S)$

(3) S

(4) $(2-S)$

65. In a 3-phase slip-ring induction motor, 3-phase balanced supply is given to the rotor and stator winding is short-circuited. The rotor would

(1) run at half the synchronous speed

(2) run in the direction of rotating field

(3) not run

(4) run against the direction of rotating field

66. In case of a 3-phase induction motor, shaft power is 2700 W and mechanical losses are 180 W. At a slip of 4%, the rotor ohmic loss will be

(1) 115.2 W

(2) 120 W

(3) 108 W

(4) 105 W

67. The maximum possible speed of a 3-phase, 50 Hz squirrel cage induction motor running at a slip of 4% is

(1) 3000 rpm

(2) 960 rpm

(3) 1440 rpm

(4) 2880 rpm

68. A 3-phase 440V, 50 Hz induction motor has 4% slip. The frequency of rotor current will be

(1) 50 Hz

(2) 25 Hz

(3) 5 Hz

(4) 2 Hz

69. The rotor slots in a 3-phase induction motor are kept inclined. This phenomenon is known as

(1) Crawling

(2) Skewing

(3) Cogging

(4) None of these

70. A 1 kVA, 400 Hz transformer is desired to be used at a frequency of 60 Hz. The kVA rating of the transformer at this reduced frequency is

(1) 500 kVA

(2) 150 kVA

(3) 550 kVA

(4) 82.5 kVA

71. A transformer can have zero voltage regulation at

(1) Leading power factor

(2) Lagging power factor

(3) Unity power factor

(4) Zero power factor

72. In a 3-phase induction motor, the maximum torque

(1) varies inversely as rotor circuit resistance.

(2) is independent of rotor circuit resistance.

(3) is constant.

(4) varies as rotor circuit resistance.

73. A 40 kVA transformer has a core loss of 400 W and a full-load copper loss of 800 W. The proportion of full-load at maximum efficiency is

(1) 62.3%

(2) 100%

(3) 70.7%

(4) 50%

74. A 400V/100V, 10 kVA two-winding transformer is reconnected as an autotransformer across a suitable voltage. The maximum rating of such a transformer could be

(1) 15 kVA

(2) 8.75 kVA

(3) 50 kVA

(4) 12.5 kVA

75. A 3-phase delta-star transformer has secondary to primary turns ratio per phase of 5 for a primary line current of 10A, the secondary line current would be

(1) 1.633 A

(2) 1.155 A

(3) 50 A

(4) 3.464 A

76. A two winding transformer is

(1) conductively linked

(2) electrically linked

(3) not linked at all

(4) inductively linked

77. Transformer maximum efficiency, for a constant load current occurs at

(1) zero p.f. leading

(2) unity p.f.

(3) any p.f.

(4) zero p.f. lagging

78. A 1 : 5 step-up transformer has 120V across the primary and 600 ohms resistance across the secondary. Assuming 100% efficiency, the primary current equals

(1) 5 Amp

(2) 10 Amp

(3) 20 Amp

(4) 0.2 Amp

79. A 3 : 1 transformer has impedance of (1 + j5) Ω on the L.V. side and (9 + j45) Ω on the H.V. side. The total equivalent impedance of the H.V. terminal is

(1) 8 + j40 Ω

(2) 2 + j10 Ω

(3) 18 + j90 Ω

(4) 10 + j50 Ω

80. Ring main distribution system is preferred to a radial system, because

(1) It is less expensive

(2) Voltage drop in the feeder is less

(3) Power factor is higher

(4) Supply is more reliable

81. The inductance of a power transmission line increases with

(1) Decreases in line length

(2) Increase in diameter of conductor

(3) Increase in spacing between the phase conductors

(4) Increase in load current carried by the conductors

82. The selection of size of conductors for a distributor in a distribution system is governed by

(1) Corona loss

(2) Temperature rise

(3) Radio interference

(4) Voltage drop

83. When a fixed amount of power is to be transmitted, the efficiency of transmission increases when

(1) Voltage decreases, power factor remains constant

(2) Voltage increases, power factor increases

(3) Voltage decreases, power factor decreases

(4) Voltage constant, power factor decreases

84. The transient stability of the power system can be effectively improved by

(1) Excitation control

(2) Phase shifting transformer

(3) Single pole switching of circuit breakers

(4) Increasing the turbine valve opening

85. The load flow analysis, the load connected at a bus is represented as

(1) Constant current drawn from the bus

(2) Constant impedance connected at the bus

(3) Voltage and frequency dependent source at the bus

(4) Constant real and reactive drawn from the bus

86. The surge impedance of a 400 kM long overhead transmission line is 400 ohms. For a 200 kM length of the same line, the surge impedance will be

(1) 200 Ω

(2) 800 Ω

(3) 400 Ω

(4) 100 Ω

87. A Buchholz relay is used for

(1) Protection of a transformer against internal faults

(2) Protection of a transformer against external faults

(3) Protection of a transformer against both internal and external faults

(4) Protection of induction motors

88. The insulation resistance of a cable of length 10 kM is 1 MΩ. For a length of 100 kM of the same cable, the insulation resistance will be

(1) 1 MΩ

(2) 10 MΩ

(3) 0.1 MΩ

(4) 0.01 MΩ

89. Resistance switching is normally employed in

(1) all breakers

(2) bulk oil breakers

(3) minimum oil breakers

(4) air blast circuit breakers

90. Which material is used in controlling chain reaction in a nuclear reactor ?

(1) Thorium

(2) Heavy water

(3) Boron

(4) Beryllium

91. In order to have a lower cost of electrical energy generation

(1) The load factor and diversity factor should be low

(2) The load factor should be low but diversity factor should be high

(3) The load factor should be high but diversity factor should be low

(4) The load factor and diversity factor should be high

92. Gauss-Seidel iterative method can be used for solving a set of

(1) Linear differential equations only

(2) Linear algebraic equations only

(3) Both linear and non-linear algebraic equations

(4) Both linear and non-linear differential equations

93. If α is the angle of voltage wave at which an R-L circuit is switched in and θ is the impedance angle of the R-L circuit, there will be no transient when the circuit is switched in, if :

(1) $\alpha = 90 - \theta$

(2) $\alpha = \theta$

(3) $\alpha = 90 + \theta$

(4) None of these

94. Reactance relay is normally preferred for protection against

(1) Earth faults

(2) Phase faults

(3) Open-circuit faults

(4) None of these

95. If the fault current is 2000A, the relay setting is 50% and CT ratio is 400/5 the plug setting multiplier will be

(1) 15

(2) 25

(3) 10

(4) 50

96. High Voltage DC (HVDC) transmission is mainly used for

(a) bulk power transmission over very long distances.

(b) interconnecting two systems with the same nominal frequency.

(c) eliminating reactive power requirement in the operation.

(d) minimizing harmonics at the converter stations.

Which of the following option is correct ?

(1) (a) only

(2) (a) and (b) only

(3) (a) and (d) only

(4) (a), (b), (c) and (d)

97. Series capacitive compensation in EHV transmission lines is used to

(1) reduce the line loading

(2) improve the stability of the system

(3) reduce the voltage profile

(4) improve the protection of the line

98. Bundle conductors are used in transmission lines, the effective capacitance and inductance will respectively

(1) decrease and increase

(2) increase and decrease

(3) remain same and increase

(4) decrease and remain same

99. Corona losses are minimized when

(1) Conductor size is reduced

(2) Smooth conductor is used

(3) Sharp points are provided in the line hardware

(4) Current density in conductors is reduced

100. An industrial consumer has a daily load pattern of 2000 kW, 0.8 lag for 12 hours, and 1000 kW, UPF for 12 hours. The load factor is

(1) 0.5

(2) 0.75

(3) 0.65

(4) 2.0

101. In the protection of transformers, harmonic restraint is used to guard against

(1) Magnetizing inrush current

(2) Unbalanced operation

(3) Lightning

(4) Switching over-voltages

102. A shunt reactor of 100 MVAr is operated at 98% of its rated voltage and at 96% of its rated frequency. The reactive power absorbed by the reactor is

(1) 98 MVAr

(2) 104.02 MVAr

(3) 96.04 MVAr

(4) 100.04 MVAr

103. The time taken for each iteration in Newton Raphson method compared to Gauss Seidel method is

(1) More

(2) Equal

(3) Less

(4) Depend upon the size of the power system

104. Y_{Bus} Matrix is a

(1) Null Matrix

(2) Sparse Matrix

(3) Full Matrix

(4) Unity Matrix

105. The voltage phasor of a circuit is $10 \angle 15°$ V and the current phasor is $2 \angle -45°$ A. the active and the reactive powers in the circuit are respectively

(1) 10 W and 17.32 VAR

(2) 5 W and 8.66 VAR

(3) 20 W and 60 VAR

(4) $20\sqrt{2}$ W and $10\sqrt{2}$ VAR

106. In a load flow solution $V_i = 1.083 \angle 15°$ Pu and $V_k = 0.986 \angle -2°$ Pu. What is the direction of active power (P) and reactive power (Q) flow in the line i – k ?

(1) P flows from i to k and Q flows from k to i.

(2) P and Q flow i to k

(3) Both flow from k to i

(4) Data is insufficient to determine direction

107. Transmission loss is

(1) a function of real-power generation

(2) independent of real-power generation

(3) a function of reactive power generation

(4) a function of bus voltage-magnitude and its angle

108. The charging current in the transmission line

(1) leads the voltage by 90°

(2) lags the voltage by 90°

(3) leads the voltage by 45°

(4) lags the voltage by 45°

109. The incremental fuel costs of two plants are given by

$$\frac{dF_1}{dP_1} = 0.01\,P_1 + 2.0 \text{ Rs/MWhr}$$

$$\frac{dF_2}{dP_2} = 0.012\,P_2 + 1.6 \text{ Rs/MWhr}$$

For economic schedule of a load of 180 MW

(1) $P_1 = 100$ MW ; $P_2 = 80$ MW

(2) $P_1 = 90$ MW ; $P_2 = 90$ MW

(3) $P_1 = 80$ MW ; $P_2 = 100$ MW

(4) $P_1 = 120$ MW ; $P_2 = 60$ MW

110. If the inertia constant H = 9.0 MJ/MVA for a 50 MVA generator, the stored energy is

(1) 9.0 MJ

(2) 125 MJ

(3) 450 MJ

(4) 5.55 MJ

111. For critical restriking voltage damping, the resistance across the breaker contact is –

(1) $R = \sqrt{\frac{L}{C}}$

(2) $R = \sqrt{\frac{C}{L}}$

(3) $R = \frac{1}{2}\sqrt{LC}$

(4) $R = \frac{1}{2}\sqrt{\frac{L}{C}}$

112. The critical clearing angle of a power system is related to

(1) reactive power limit

(2) short circuit limit

(3) steady state stability limit

(4) transient stability limit

113. In a line to ground fault on a system, the fault current is 1500 A. The zero sequence current is

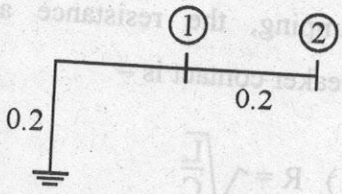
(1) 1500 A

(2) 0 A

(3) 750 A

(4) 500 A

114. In the network as shown below, the marked parameters are PU impedances. The bus admittance matrix of the network is



(1) $\begin{bmatrix} 10 & -5 \\ -5 & 5 \end{bmatrix}$

(2) $\begin{bmatrix} -5 & 5 \\ 5 & -10 \end{bmatrix}$

(3) $\begin{bmatrix} 5 & -5 \\ -5 & 10 \end{bmatrix}$

(4) $\begin{bmatrix} -10 & 5 \\ 5 & -5 \end{bmatrix}$

115. A string insulator has 4 units. The voltage across the bottom-most unit is 33.33% of the total voltage. Its string efficiency is

(1) 33.33%

(2) 25%

(3) 75%

(4) 66.7%

116. A wind turbine has rotor diameter of 10 metre and 45% efficiency. Then the output power of wind turbine at a wind speed of 20 m/sec and air density of 1.293 kg/m^3 will be –

(1) 406.2 kW

(2) 182.8 kW

(3) 9.14 kW

(4) 1624.8 kW

117. The angle between the Sun's rays and a line perpendicular to the horizontal plane through angle of the beam of the sun and vertical is called _____.

(1) Solar Azimuth Angle

(2) Zenith Angle

(3) Altitude Angle

(4) Declination

118. Which of the following materials cannot be used as solar cells materials ?

(1) Si

(2) GaAS

(3) CdS

(4) PbS

119. In a steam power plant heat from the flue gases is recovered in

(1) a condenser

(2) a chimney

(3) economizer and air preheater

(4) a desuper heater

120. The current I in the circuit of Fig. is :

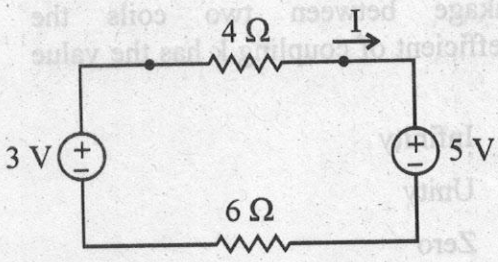


Fig.

(1) – 0.8A

(2) – 0.2A

(3) 0.2A

(4) 0.8A

121. At a particular instant, an inductance of 2H carries a current of 4A, while the voltage across is 2V. The energy stored in the inductance in joules is

(1) 1

(2) 2

(3) 6

(4) 16

122. The reciprocal of resistance is :

(1) Voltage

(2) Current

(3) Conductance

(4) Coulombs

123. In the circuit of Fig., Req is given by

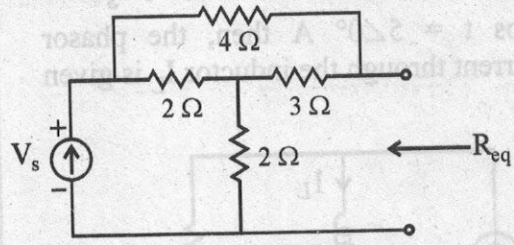


Fig.

(1) 5Ω

(2) 2Ω

(3) 4Ω

(4) 6Ω

124. For a given voltage, four heating coils will produce maximum heat, when connected

(1) all in parallel

(2) all in series

(3) with two parallel pairs in series

(4) one pair in parallel with the other two in series

125. For the circuit, the Thevenin Voltage and resistance as seen at 'AB' in Fig. are

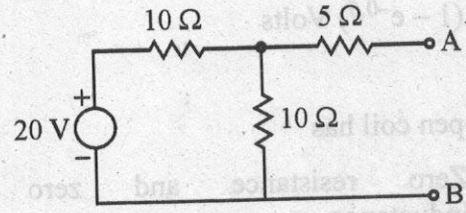


Fig.

(1) 10V, 10Ω

(2) 10V, 15Ω

(3) 20V, 10Ω

(4) 5V, 15Ω

126. For the circuit shown below, $I_S = 5$ Cos $t = 5\angle 0°$ A then, the phasor current through the inductor I_L is given by

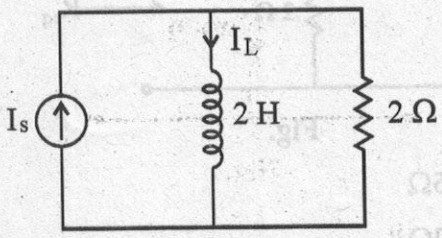


Fig.

(1) $5\angle 45°$ A

(2) $\frac{5}{\sqrt{2}}\angle -45°$ A

(3) $5\angle -45°$ A

(4) $10\sqrt{2}\angle 45°$A

127. A voltage is given by $V(S) = \frac{1}{S(S+a)}$ if $V(\infty) = 2$ Volts, then $V(1)$ is

(1) $(1 - e^{-1})$ Volts

(2) e^{-1} Volts

(3) $2\left(1 - \frac{1}{e^{0.5}}\right)$ Volts

(4) $(1 - e^{-0.5})$ Volts

128. An open coil has

(1) Zero resistance and zero inductance

(2) Infinite resistance and infinite inductance

(3) Infinite resistance and zero inductance

(4) Zero resistance and infinite inductance

129. Under the condition of zero flux leakage between two coils the coefficient of coupling k has the value of

(1) Infinity

(2) Unity

(3) Zero

(4) None of these

130. Which of the following is correct ?

(1) y_{11} is the inverse of z_{11}

(2) g_{11} is the inverse of h_{11}

(3) t_{11} is the inverse of t_{11}^{1}

(4) All of these

131. A function in the time-domain has half-wave symmetry. The Fourier series of the function will be made up of harmonics containing

(1) odd cosine terms

(2) odd sine terms

(3) odd cosine and sine terms

(4) None of these

132. A parallel RLC circuit is said to be underdamped when

(1) $R < 2\sqrt{\frac{L}{C}}$

(2) $R > \frac{1}{2}\sqrt{\frac{L}{C}}$

(3) $R > 2\sqrt{\frac{L}{C}}$

(4) $R < \frac{1}{2}\sqrt{\frac{L}{C}}$

133. The current/phase in a star connected load supplied by a three phase 380V supply is 10A. Which of the following gives the impedance/phase of the load ?

(1) 65.82 Ω

(2) 26.87 Ω

(3) 21.94 Ω

(4) 19.0 Ω

134. The development of nodal equations is based on

(1) KVL

(2) KCL

(3) Ohm's law

(4) All of these

135. The Laplace transform of a unit ramp function at t = a is –

(1) $\frac{1}{(s+a)^2}$

(2) $\frac{e^{-as}}{(s+a)^2}$

(3) $\frac{a}{s^2}$

(4) $\frac{e^{-as}}{s^2}$

136. Which of the following holds good when a sinusoidal voltage is applied to a pure inductance ?

(1) In one half cycle energy is absorbed

(2) In the next half cycle energy is released

(3) Continuous exchange of energy

(4) All of these

137. For the single-element two-port network in Fig., z_{11} is

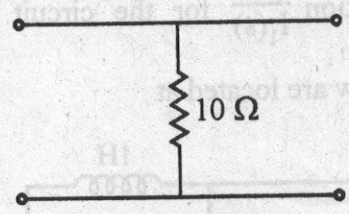


Fig.

(1) 0

(2) 5

(3) 10

(4) 20

138. If the input to a linear system is $\delta(t)$ and the output is $e^{-2t}\,u(t)$, the transfer function of the system is :

(1) $\frac{1}{s+2}$

(2) $\frac{1}{s-2}$

(3) $\frac{s}{s+2}$

(4) $\frac{s}{s-2}$

139. The Fourier transform of e^{j2t} is :

(1) $\frac{1}{2+jw}$

(2) $\frac{1}{-2+jw}$

(3) $2\pi\,\delta\,(w-2)$

(4) $2\pi\,\delta\,(w+2)$

140. The poles and zeros of the transfer function $\frac{I_2(s)}{I_1(s)}$ for the circuit shown below are located at

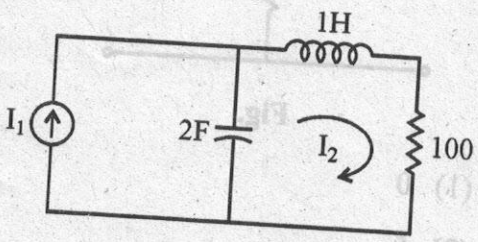


Fig.

(1) No zeros

Poles : 0, –200

(2) Zeros : –1, –50

Poles : 0, –100

(3) No Zeros

Poles : –1, –50

(4) Zeros : 0, –200

Poles : –1, –50

141. The transfer function $\frac{V_o(s)}{V_i(s)} = \frac{5s}{s^2 + 5s + 25}$ is for an active

(1) low pass filter

(2) band pass filter

(3) high pass filter

(4) all pass filter

142. Three equal resistances connected in star take a line current of 10A when fed from 400V, 50 Hz source. If the load resistances are reconnected in delta, the line current would be

(1) $10\sqrt{3}$A

(2) 10A

(3) $\frac{10}{\sqrt{3}}$A

(4) 30A

143. The resonant frequency of the given series circuit is

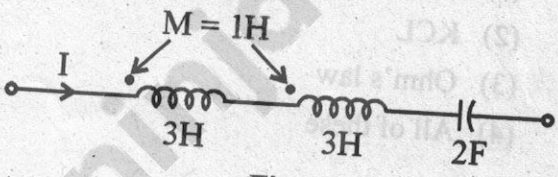


Fig.

(1) $\frac{1}{2\pi\sqrt{3}}$ Hz

(2) $\frac{1}{8\pi}$ Hz

(3) $\frac{1}{4\pi\sqrt{2}}$ Hz

(4) $\frac{1}{2\pi\sqrt{2}}$ Hz

144. The instantaneous value of currents in both phases B and C of a 3-phase balanced system are – 20A. For a phase sequence of ABC, the instantaneous value of current in phase A is

(1) – 40A

(2) 20A

(3) 40A

(4) – 20A

145. A resonating circuit has 10 Ω resistance. If the supply is 20V, the power at half power frequency will be

(1) 2.5 W

(2) 5 W

(3) 10 W

(4) 20 W

146. The input frequency of the given circuit for unity power factor operation is

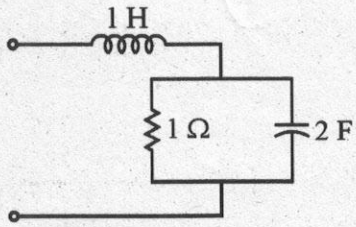


Fig.

(1) 1 rad/sec

(2) 0.5 rad/sec

(3) 1.5 rad/sec

(4) 0.25 rad/sec

147. The overall inductance of two coils connected in series, with mutual inductance opposing self-inductance is L_1, with mutual inductance aiding self-inductance the overall inductance is L_2. The mutual inductance M is given by

(1) $(L_1 - L_2)$

(2) $\frac{1}{2}(L_1 - L_2)$

(3) $\frac{1}{4}(L_2 - L_1)$

(4) $\frac{1}{4}(L_1 - L_2)$

148. Which of the following is a correct representation of the unit of measure of attenuation ?

(1) $10 \log_{10}\left(\frac{P_1}{P_2}\right)$

(2) $20 \log_{10}\left|\frac{V_1}{V_2}\right|$

(3) $dB = 20 \log_{10}\left|\frac{I_1}{I_2}\right|$

(4) All of these

149. Given $A = 2\ I_x + \alpha\ I_y + 2\ I_z$ and $B = \alpha\ I_x + I_y + I_z$, if A and B are normal to each other, α is

(1) 1

(2) –2/3

(3) –1

(4) 0

150. The design parameters of a constant k high pass filter can be calculated by –

(1) $L = \frac{1}{4\pi\ fc}$ and $C = 4\pi\ fc$

(2) $L = 4\pi\ fc$ and $C = \frac{1}{4\pi\ fc}$

(3) $L = \frac{R}{4\pi\ fc}$ and $C = \frac{1}{4\pi\ fc}$

(4) $L = \frac{R}{4\pi\ fc}$ and $C = \frac{1}{4\pi\ fcR}$

रफ कार्य के लिए स्थान / SPACE FOR ROUGH WORK