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Set - **A**

Hall Ticket No.

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BOOKLET No. 11545

Duration : 2 Hours

No. of Questions : 100

Maximum Marks : 100

INSTRUCTIONS TO THE CANDIDATES

1. This booklet is a question paper only. A separate Optical Mark Reader (OMR) answer sheet is issued to you.
2. Candidate should sign in the space provided on the OMR answer sheet. Further ensure that the invigilator puts his/her signature in the space provided on the OMR answer sheet.
3. All answers have to be marked by using Black Ball Point pen in the OMR sheet supplied.
4. Question Paper Booklet contains 100 questions. Each question carries one mark.
5. Immediately after opening the Question Paper Booklet, please check for (i) Serial number of questions (1-100), (ii) The number of pages (16) and (iii) Correct printing. In case of any defect, please report to the invigilator and ask for replacement of Question Paper Booklet immediately.
6. Use of calculators, Mathematical/Log Tables, Mobiles, blue tooth devices or any other electronic gadgets is strictly prohibited.
7. Rough work should be done only in the space provided for this purpose in Question paper booklet.
8. **The OMR Answer sheet should not be folded, bent or rolled.**
9. No part or page of the question paper booklet and OMR sheet to be torn, detached or removed. The OMR answer sheet should be returned at the end of examination.
10. Any candidate indulging in any mal-practice will be disqualified.

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1. The speed–torque characteristic of a series motor is a/an
 - (a) Circle
 - (b) Parabola
 - (c) Ellipse
 - (d) Hyperbola
2. In a d.c. generator, if the variable loss is equal to constant loss, then the efficiency is
 - (a) Zero
 - (b) Minimum
 - (c) Maximum
 - (d) 50%
3. The armature of a dc machine is laminated to reduce
 - (a) Copper loss
 - (b) Eddy current loss
 - (c) Friction loss
 - (d) Windage loss
4. The initial flux in dc generator is provided by
 - (a) Initial voltage
 - (b) Initial power
 - (c) Initial current
 - (d) Residual magnetism
5. For the operation of milling machine, the following motor is used
 - (a) DC series motor
 - (b) DC shunt motor
 - (c) DC compound motor
 - (d) DC short shunt compound motor
6. In a series motor, the torque is
 - (a) proportional to armature current
 - (b) proportional to square of the armature current
 - (c) proportional to field current
 - (d) constant
7. By conducting Swinburn's test on a DC machine, the following losses can be determined
 - (a) Constant losses
 - (b) Variable losses
 - (c) Armature copper losses
 - (d) Friction and windage losses
8. The series motors have a relatively
 - (a) Zero starting torque
 - (b) Low starting torque
 - (c) High starting torque
 - (d) Medium starting torque

9. In a dc shunt motor, the torque developed is 15Nm at 10A of load current. If the load current is doubled, the new torque will be
 (a) 0 Nm (b) 15Nm (c) 30Nm (d) 60Nm
10. The internal characteristic of a dc shunt generator is a plot between
 (a) Induced emf and armature current (b) Terminal voltage and load current
 (c) Induced emf and field current (d) Terminal voltage and field current
11. The back emf of motor at the time of starting is
 (a) zero (b) maximum (c) moderate (d) infinite
12. At low flux densities, the flux in a d.c generator varies
 (a) Linearly with the armature current (b) Non-linearly with the armature current
 (c) Linearly with the field current (d) Non-linearly with the field current
13. Three resistances of R ohms each are connected in delta. Its equivalent resistances in star connection per phase is
 (a) R/3 each (b) R each (c) 3 R each (d) 3R, R & R/3
14. The RMS value of a triangular wave of alternating quantity having peak value 3 A is
 (a) $\sqrt{3}$ Amps (b) 3 Amps (c) $2\sqrt{3}$ Amps (d) 1 Amp
15. In a series RL circuit, the voltage across the resistance is 40V and voltage across inductance is 40V. Then the total voltage across the series circuit is
 (a) 40 V (b) 56.56 V (c) 80 V (d) 5.656 V
16. A transformer can have regulation closer to zero
 (a) On lagging power factor (b) On leading power factor
 (c) On zero power factor (d) On unity power factor
17. The full load copper loss of a transformer is 1600 watts. At half-load, the copper loss will be
 (a) 400 watts (b) 800 watts (c) 1600 watts (d) 6400 watts
18. A 440/110V, 1-phase Transformer has a primary resistance of 0.03Ω and secondary resistance of 0.02Ω . Its iron losses at normal input are 150 watts. The secondary current at which the maximum efficiency will occur is
 (a) 63.56 A (b) 70.28 A (c) 82.80 A (d) 46.39 A

19. Which of the following Transformers should never have the secondary open circuited while the primary is energized?
- (a) Power transformer (b) Potential transformer
(c) Current transformer (d) Auto transformer
20. An Isolation Transformer has primary to secondary turn's ratio of
- (a) 1:1 (b) 1:2 (c) 2:1 (d) 1:3
21. In a 50 KVA, 1-phase Transformer, the iron loss is 500W and full load copper loss is 800W. The efficiency of the Transformer at full load at 0.8 p.f lagging is (in %)
- (a) 92 (b) 89.56
(c) 96.85 (d) 79.82
22. A synchronous motor can be used as a synchronous capacitor when it is
- (a) Over loaded (b) Under loaded
(c) Over excited (d) Under excited
23. The harmonic component of the generated emf will be more in alternators with
- (a) Full pitch coils (b) Short pitch coils
(c) Long pitch coils (d) None of the above
24. V-curves for a synchronous motor represent the relation between
- (a) Armature current and field current (b) Field current and speed
(c) Field current and power factor (d) Power factor and speed
25. The crawling in an induction motor is caused by
- (a) High loads (b) Low supply voltages
(c) Improper design of machine (d) Harmonics developed in the motor
26. The ratio of starting torque to normal torque in case of a star-delta starter will be
- (a) $1/3$ (b) $1/\sqrt{3}$
(c) 1.0 (d) $\sqrt{3}$
27. A 3-phase, 440V, 50Hz induction motor has 4% slip. The frequency of rotor emf will be
- (a) 0.2Hz (b) 2 Hz
(c) 50Hz (d) 200Hz

28. In a tuned line
- receiving end voltage and current are numerically equal to corresponding sending end values
 - receiving end voltage and current are greater than corresponding sending end values
 - receiving end voltage is greater than sending end voltage, but the corresponding currents are equal
 - receiving end voltage and sending end voltages are equal, but the sending end current is less than receiving end current.
29. The maximum torque in an induction motor depends on
- Frequency
 - Rotor resistance
 - Supply current
 - Stator Inductance
30. Which of the following motors will have relatively high power factor?
- Capacitor – run motor
 - Shaded pole motor
 - Capacitor –start motor
 - Split – phase motor
31. Which of the following motors can be used for unity power factor
- Schrage motor
 - Hysterisis motor
 - Shaded pole motor
 - Capacitor run motor
32. Which of the following turbines will be used for heads from 500m to 200m
- Kaplan
 - Fixed vane propeller
 - Francis
 - Pelton wheel
33. The sudden change of pressure in penstock pipes due to sudden reduction of load is avoided using
- tail race
 - water hammer
 - surge tank
 - spill way
34. Which of the following heat exchangers is used to raise the temperature of steam from normal to supersaturation level
- air pre heater
 - economizer
 - superheater
 - condenser

35. Which of the following treatments for water is used to remove non carbonate hardness
- (a) Lime treatment (b) Soda treatment
(c) Distillation (d) Sedimentation
36. The hoppers in electrostatic precipitator are generally _____ in shape
- (a) cylindrical (b) pyramidal (c) conical (d) rectangular
37. The purpose of cooling tower is
- (a) to send cool water to boiler (b) to reduce the flue gas temperature
(c) to cool the air to be sent to furnace (d) to cool the steam in the condenser
38. The following is used to reduce the speed of the neutrons in a nuclear reactor
- (a) moderator (b) control rods
(c) core (d) coolant
39. Which of the following is a cladding material in nuclear reactor
- (a) Heavy water (b) Organic liquids
(c) Boron (d) Magnesium
40. In which of the following reactors, reactor control is achieved by varying moderator level
- (a) P W R (b) B W R
(c) Liquid metal cooled reactor (d) CANDU
41. A generating station has a connected load of 450MW and a maximum demand of 250MW. The units generated are 615×10^6 per annum. The load factor of the station is
- (a) 0.586 (b) 0.615 (c) 0.281 (d) 0.725
42. The plant capacity is determined by
- (a) maximum demand of a consumer
(b) plant use factor
(c) simultaneous maximum demand of all consumers
(d) load factor
43. A power plant has a maximum demand of 15MW. The load factor is 50% and the plant factor is 40%. The operating reserve is
- (a) 3 MW (b) 3.75 MW (c) 6.0 MW (d) 7.5 MW

44. A transformer is rated at 66 KV / 400 V, 1000 KVA, 5% reactance. The short circuit MVA of the transformer when connected to infinite bus is
- (a) 1 MVA (b) 10 MVA (c) 2 MVA (d) 20 MVA
45. The power frequency rms voltage, that appears across the breaker contacts after the transient oscillations die out and final extinction of arc that results in all the poles is called
- (a) recovery voltage (b) restriking voltage
(c) cut - in voltage (d) race voltage
46. In resistance switching, the function of shunt resistor
- (a) in a multi break C.B., it helps to distribute currents uniformly
(b) increases transient voltages during switching out inductive or capacitive loads
(c) reduces the rate of rise of restriking voltage
(d) deionizes the medium between contacts
47. The number of poles per phase of breaker is a function of
- (a) current to be chopped (b) operating voltage
(c) power frequency (d) recovery voltage
48. The capacitor switching is easily done with
- (a) air blast C.B. (b) oil C.B.
(c) vacuum C.B. (d) SF₆ C.B
49. A distance relay is said to be inherently directional if its characteristic on R-X diagram is
- (a) a straight line off-set from origin (b) a circle that encloses origin
(c) a parabola whose focus is origin (d) a circle that passes through origin
50. The most efficient torque producing actuating structure in an induction relay is
- (a) shaded pole structure (b) watt-hour meter structure
(c) single induction loop structure (d) induction cup structure
51. The line trap unit employed in carrier current relaying
- (a) offers high impedance to 50HZ power frequency signals
(b) offers high impedance to carrier frequency signals
(c) offers low impedance to carrier frequency signals
(d) acts as protective device

52. The protection relay used for low fault settings and high operating speeds in a transformer is
 (a) Merz-Price protection (b) harmonic restraint relay
 (c) Buchholz's relay (d) translay relay
53. The wattmetric relay with directional characteristic is used for the protection of generator against
 (a) loss of excitation (b) over speed
 (c) failure of prime mover (d) earth fault
54. The best suited relay for 3-zone protection scheme is
 (a) impedance relay (b) reactance relay
 (c) mho relay (d) over current relay
55. The Rule 77 of Indian electricity Rules (1956) for over head lines gives information about
 (a) materials and strength (b) Maximum stress and factor of safety
 (c) earthing (d) clearance above ground of lowest conductor
56. The stringing charts are used to calculate
 (a) string efficiency (b) A,B,C,D parameters
 (c) Carona (d) tension and sag at any temperature
57. Due to proximity effect, the effective internal reactance of the conductor
 (a) decreases (b) increases
 (c) does not change (d) becomes infinity
58. The inductance of a single phase two wire transmission line per kilometer gets doubled when the
 (a) distance between the two wires is doubled
 (b) distance between the wires is increased fourfold
 (c) distance between the wires is increased as square of the original distance
 (d) radius of the wire is doubled.
59. A transmission line of 210 km length has certain values for A,B,C and D parameters. If the length of line is made 100 km then
 (a) A increases and B decreases (b) A and B both decrease
 (c) A and B both increase (d) A decreases and B increases

60. The surge impedance loading of a line is proportional to
 (a) \sqrt{V} (b) V (c) V^2 (d) V^3
61. Under no load conditions the current in a transmission line is due to
 (a) Corona effect (b) Capacitance of the line
 (c) Spinning reserve (d) Back flow from earth
62. For a transmission line, the no load receiving end voltage is more than the sending end voltage. This is called
 (a) Ferranti effect (b) skin effect (c) proximity effect (d) corona
63. Corona loss can be reduced by the use of hollow conductor, because
 (a) the current density is reduced
 (b) the eddy current in the conductor is eliminated
 (c) for a given cross section, the radius of the conductor is increased
 (d) of better ventilation in the conductor
64. The non shielding method of over voltage protection is based on the principle of
 (a) allowing arc path between ground and conductor
 (b) insulation break down
 (c) switching capacitor banks
 (d) none of the above
65. The valve elements of non linear resistance in valve type lightning arrester are made up of
 (a) porcelain (b) stainless steel
 (c) zeolite (d) silicon carbide
66. Which of the following lightning arresters, can discharge currents, between 65,000 to 1,00,000 A
 (a) station type (b) line type
 (c) distribution type (d) rod gaps
67. Which of the following is used to reduce tower footing resistance
 (a) ground rods (b) counter poise
 (c) horn gap (d) surge absorber

68. In the case of rigid bus arrangement, the size of alluminium pipe used for voltage level of 66KV is
 (a) 40 mm (b) 65 mm (c) 80 mm (d) 100 mm
69. In substations, the breaker maintenance facility is provided in the
 (a) double busbar scheme (b) single busbar scheme
 (c) main and transfer bus scheme (d) all of these
70. For low voltage applications up to 11 KV, which of the following insulators is preferred.
 (a) Pin type (b) Suspension type (c) Strain type (d) None of these
71. In a 5 insulator disc, string capacitance between each unit and earth is $1/6$ th of the mutual capacitance. The voltage distribution across the middle unit as % of voltage applied is
 (a) 11.15 (b) 13.1 (c) 17.1 (d) 34.85
72. An electric train taking of constant current of 600 A moves on a section of line between two substations 8 km apart maintained at 575 V and 590 V respectively. The track resistance is 0.04 Ohm per km both go and return. The point of minimum potential along the track is at a distance from 575 V substation is
 (a) 6 km (b) 3.67 km (c) 3.97 km (d) 3.77 km
73. Which of the following is the most economical a-c distribution system
 (a) a.c 2 phase 4 wire (b) a.c 2 phase 3 wire
 (c) a.c 3 phase 4 wire (d) a.c 3 phase 3 wire
74. For a distributor design, if the voltage rating is increased by 'n' times, the conductor size reduces to _____ of the original
 (a) $1/n$ (b) $1/n^2$ (c) $1/n^4$ (d) $1/\sqrt{n}$
75. The pointer of an indicating instrument is generally made of
 (a) Copper (b) Aluminum (c) Silver (d) Soft steel
76. Electrostatic Instruments are used as—— only
 (a) Ammeters (b) Voltmeters (c) Wattmeters (d) Energy meters

77. In a dynamometer wattmeter, the moving coil is the
 (a) Current coil (b) Low p.f coil (c) potential coil (d) compensating coil
78. A 50 V range Voltmeter has a sensitivity of $20 \text{ k}\Omega/\text{V}$. The total resistance of the voltmeter is
 (a) $2.5 \text{ k}\Omega$ (b) $0.4 \text{ k}\Omega$ (c) $10 \text{ k}\Omega$ (d) $1 \text{ M}\Omega$
79. An R-L-C series resonant circuit has a Q of 15 and a source voltage of 50V. The voltage across the Capacitor at resonance is —
 (a) 750V (b) 50V (c) 15V (d) 375V
80. At Parallel resonance conditions the power factor is
 (a) Zero lagging (b) Unity (c) 0.8 lagging (d) 0.8 leading
81. In an A.C circuit, V and I are given by:
 $V=100 \sin (100t)$ Volts and $I=100 \sin (100t + \pi / 3)$ mA. The power dissipated in the circuit is
 (a) 2.5 W (b) 10W (c) 2500W (d) 10000W
82. In the measurement of 3-phase power by two wattmeter method, the two wattmeters indicate equal readings if the power factor is
 (a) Zero lagging (b) Unity (c) 0.5 lagging (d) 0.8 lagging
83. In a parallel RLC circuit, below resonance frequency, the circuit behaves as
 (a) Inductive (b) Resistive (c) Capacitive (d) Suceptive
84. In a balanced 3-phase star connected system, the phase difference between line & phase voltages is
 (a) 30° (b) 90° (c) 120° (d) 60°
85. The electric Heater draws 10 A from a 230 V line. The resistance of the heater is
 (a) 230Ω (b) 2300Ω (c) 23Ω (d) 2.3Ω
86. A wire has a resistance of 12 ohms. It is bent in the form of an equilateral triangle. The effective resistance between any two corners of the triangle is
 (a) $8/3 \Omega$ (b) $12/3 \Omega$ (c) 2Ω (d) $10/3 \Omega$

87. ACSR stands for
- (a) Aluminium Copper Steel Reinforced
 - (b) Aluminium Copper Stranded Reinforced
 - (c) Aluminium Conductor Steel Reinforced
 - (d) Aluminium Conductor Stranded Reinforced
88. In house wiring, the total connected load per sub-circuit can be
- (a) 400 W
 - (b) 800 W
 - (c) 1500 W
 - (d) 2000 W
89. Which of the following motors is used for intermittent high torque load and for rolling mills?
- (a) DC series motor
 - (b) DC shunt motor
 - (c) DC cumulative compound wound motor
 - (d) DC differential compound wound motor
90. In plugging of dc motors
- (a) Connections to armature are reversed
 - (b) Connections to field are reversed
 - (c) Connections to both armature and field are reversed
 - (d) Connections to supply are reversed
91. The motor enclosure used in wood-working industry is
- (a) Protected type
 - (b) totally enclosed fan cooled type
 - (c) Flame-proof type
 - (d) splash proof type
92. The least expensive drive is
- (a) belt drive
 - (b) rope drive
 - (c) chain drive
 - (d) gear drive
93. The unit of luminous flux is
- (a) webers
 - (b) lux
 - (c) lumens
 - (d) Candela
94. The illumination at a surface due to a source of light placed at a distance 'd' from the surface varies as
- (a) $1/d^2$
 - (b) $1/d$
 - (c) d
 - (d) d^2

95. Reduction factor is the ratio of
- (a) M.S.C.P / M.H.S.C.P (b) M.H.C.P / M.S.C.P
(c) M.S.C.P x M.H.S.C.P (d) 1 / M.H.S.C.P
96. Power factor is the highest in case of
- (a) sodium vapour lamp (b) mercury vapour lamp
(c) incandescent lamp (d) neon lamp
97. In carbon arc welding
- (a) Electrode is positive with respect to work in case of dc supply
(b) Electrode is negative with respect to work in case of dc supply
(c) Electrode is connected to neutral in case of ac supply
(d) Electrodes are not required
98. Rolling electrodes are specifically used for
- (a) Projection welding (b) seam welding
(c) spot welding (d) flash butt welding
99. In a resistance furnace, the atmosphere is
- (a) Oxidizing (b) deoxidizing
(c) reducing (d) neutral
100. In core type furnace the secondary winding has
- (a) No turns (b) More number of turns
(c) Less number of turns (d) Equal to primary turns

Rough Work

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