राष्ट्रीय प्रौद्योगिकी संस्थान वरंगल
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NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL
WARANGAL – 506004, Telangana, INDIA

QUESTION BOOKLET – ADVANCED TEST FOR RECRUITMENT TO TECHNICAL CADRE POSTS

Post:	Technical Assistant
Department	Electrical Engineering
Advt.:	01/2026 dated 09.01.2026
Date of Exam:	16-08-2026
Duration:	2 Hours
Total Marks:	200 (100 Q X 2 M each)
No. of Questions:	100 (MCQs)
Negative Marking:	1/4th mark for every wrong answer

INSTRUCTIONS TO THE CANDIDATES

1. This is an Advanced Test comprising 100 Multiple Choice Questions (MCQs), to be conducted in MCQ mode only.
2. The duration of the test is 2 hours.
3. Answers must be marked on the OMR Answer Sheet using a blue or black ballpoint pen only. Use of pencils is not permitted.
4. Candidates must write/mark their Roll Number, Post applied for, and other required details in the designated space on the OMR Answer Sheet.
5. Answers marked on the Question Booklet or on any sheet other than the OMR Answer Sheet will not be evaluated.
6. For each question, darken the circle corresponding to the correct answer completely and clearly on the OMR Answer Sheet.
7. Each question carries equal marks. There will be a negative marking of ¼ th mark for every wrong answer. No marks will be deducted for questions not attempted.
8. Mark only one answer for each question. Marking more than one circle for a question will be treated as a wrong answer.
9. Overwriting, cutting, or erasing that leaves the OMR Answer Sheet unclear may result in the answer not being evaluated.
10. No candidate shall leave the examination hall during the test.
11. Any attempt to copy, use unfair means, or communicate with others will result in immediate disqualification.
12. The use of electronic gadgets, calculators, mobile phones, smart watches, or any written/printed material is strictly prohibited.
13. Rough work, if any, should be done only on the separate sheet provided for the purpose.
14. Ensure that the OMR Answer Sheet is duly filled and handed over to the Invigilator before leaving the examination hall.
15. Failure to submit the OMR Answer Sheet will result in cancellation of candidature.
16. All material provided, including rough sheets, must be returned before leaving the examination hall.

Q1. Kirchhoff's Voltage Law (KVL) is based on the principle of conservation of:
(A) Charge (B) Energy (C) Momentum (D) Mass

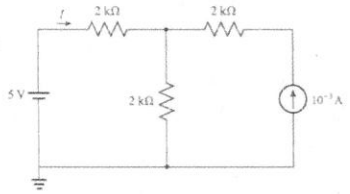
Q2. In a lumped network node, four branch currents enter the junction: $I_1 = 3\angle 0^\circ$ A, $I_2 = 4\sin(\omega t)$ A, and two unknown currents whose phasor sum equals $-j5$ A. What is the magnitude of the total instantaneous current leaving this node?
(A) 3 A (B) 5 A (C) 7 A (D) 12 A

Q3. The Superposition Theorem is strictly applicable to networks that are:
(A) Linear and bilateral (B) Nonlinear and active (C) Non-bilateral (D) Time-variant

Q4. In the application of the Superposition Theorem, ideal voltage sources are replaced by:
(A) Open circuits (B) Short circuits (C) Resistors (D) Current sources

Q5. Thevenin's equivalent circuit consists of a:
(A) Voltage source in parallel with a resistor (B) Voltage source in series with a resistor
(C) Current source in parallel with a resistor (D) Current source in series with a resistor

Q6. The current I in the circuit shown below is _____.



(A) 1.25×10^{-3} A (B) 0.75×10^{-3} A (C) -0.5×10^{-3} A (D) 1.16×10^{-3} A

Q7. Norton's equivalent circuit is the dual of:
(A) Superposition Theorem (B) Thevenin's equivalent circuit
(C) Maximum Power Transfer Theorem (D) Millman's Theorem

Q8. A source with internal resistance $R_{th} = 10\ \Omega$ is connected to a variable load resistor R_L. However, the hardware setup imposes a thermal constraint: the total power generated inside the source ($I^2 R_{th}$) cannot exceed 250 W. If $V_{th} = 100$ V, what value of R_L should be chosen to maximize the power delivered to the load *without* violating this thermal constraint?
(A) 5 Ω (B) 10 Ω (C) 15 Ω (D) 30 Ω

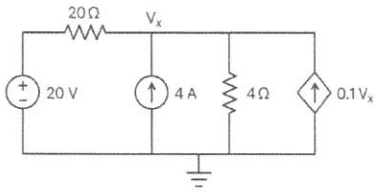
Q9. The Thevenin voltage (V_{th}) and Thevenin resistance (R_{th}) of a linear active network as viewed from a pair of load terminals are 20 V and 5 Ω respectively. If a load resistor $R_L = 5\ \Omega$ is connected across the terminals, the power transferred to the load is:
(A) 10 W (B) 20 W (C) 25 W (D) 50 W

Q10. Thevenin voltage is 10V, and Thevenin resistance is 2 Ω. What is the maximum power transferred to the load?
(A) 12.5 W (B) 25 W (C) 50 W (D) 100 W

Q11. For maximum power transfer, if the internal resistance of a source is 4 Ω, what should be the load resistance?
(A) 2 Ω (B) 4 Ω (C) 8 Ω (D) 16 Ω

Q12. Mesh analysis is strictly valid only for which type of electrical networks?
(A) Non-planar networks (B) Planar networks
(C) Networks containing only independent current sources (D) Unilateral networks

Q13. From this diagram, find Vx?



(A)20V (B) 30V (C) 15V (D) 25V

Q14. Calculate the Norton current if a Thevenin equivalent has Vth = 12V and Rth = 3 Ω.
(A) 2A (B) 36A (C) 4A (D) 15A

Q15. The core of a transformer is laminated to reduce:
(A) Hysteresis loss (B) Eddy current loss (C) Copper loss (D) Friction loss

Q16. The Open Circuit test in a transformer is primarily used to determine:
(A) Copper losses (B) Core losses (C) Equivalent resistance (D) Voltage regulation

Q17. During a Short Circuit test, the measuring instruments are typically placed on the:
(A) Low voltage side (B) High voltage side
(C) Primary side regardless of voltage (D) Secondary side regardless of voltage

Q18. A transformer operates at maximum efficiency when:
(A) Copper loss = Core loss (B) Copper loss = 0
(C) Core loss = 0 (D) Copper loss = 2 * Core loss

Q19. In an ideal transformer, the voltage regulation is:
(A) Infinity (B) 100% (C) Zero (D) Negative

Q20. Which of the following losses varies significantly with the load in a transformer?
(A) Hysteresis loss (B) Eddy current loss (C) Copper loss (D) Core loss

Q21. A single-phase auto-transformer steps down a voltage from 400 V to 300 V to supply a load of 12 kVA. What is the magnitude of power transferred inductively from the primary to the secondary circuit?
(A) 3 kVA (B) 4 kVA (C) 8 kVA (D) 9 kVA

Q22. A single-phase, 50 Hz core-type transformer has a square cross-section core with a side length of 10 cm. The maximum allowable peak flux density in the core is 1.2 T. If the primary voltage rating is 230 V, what is the exact required number of primary turns?
(A) 128 (B) 210 (C) 275 (D) 342

Q23. If full load copper loss is 1600W, the copper loss at half load is?
(A) 400W (B) 800W (C) 1600W (D) 3200W

Q24. A transformer has iron loss 400W and FL Cu loss 400W. Efficiency is max at what % of full load?
(A) 50% (B) 70.7% (C) 100% (D) 141%

Q25. A single-phase, 10 kVA, 200/400 V, 50 Hz transformer has a total equivalent resistance referred to the secondary of 0.4 Ω and a total equivalent leakage reactance referred to the secondary of 1.2 Ω. What is the percentage voltage regulation of the transformer when delivering full-load current at a 0.8 lagging power factor?
(A) 3.16% (B) 4.34% (C) 5.25% (D) 6.40%

Q26. An autotransformer steps down 250V to 200V. What is the power transferred conductively for a 10kVA load?
(A) 2 kVA (B) 8 kVA (C) 10 kVA (D) 5 kVA

Q27. If the frequency of a transformer increases by 10% keeping V constant, maximum flux density?
(A) Increases by 10% (B) Decreases by 9.09% (C) Remains same (D) Increases by 21%

Q28. Transformer rating is 10kVA. At 0.8 pf lagging, max power it can deliver is?
(A) 8 kW (B) 10 kW (C) 12.5 kW (D) 2 kW

Q29. The function of a commutator in a DC generator is to:
(A) Increase the output voltage (B) Convert alternating current to direct current
(C) Reduce sparking (D) Provide mechanical support

Q30. Which DC motor is known for having the highest starting torque?
(A) Shunt motor (B) Series motor
(C) Differentially compounded (D) Cumulatively compounded

Q31. In a DC motor, the condition for maximum mechanical power developed is when back EMF is:
(A) Equal to supply voltage (B) Half of the supply voltage
(C) Zero (D) Twice the supply voltage

Q32. A DC series motor should never be started on no-load because:
(A) It will draw excessive current (B) Its speed will become dangerously high
(C) It will not develop any torque (D) The field winding will burn out

Q33. Flux control method of speed control for a DC shunt motor provides speeds:
(A) Below the rated speed (B) Exactly at rated speed
(C) Above the rated speed (D) Zero speed

Q34. In a DC machine, the armature reaction causes:
(A) Cross-magnetization only (B) Demagnetization only
(C) Both cross-magnetization and demagnetization (D) Increase in main flux

Q35. Compensating windings are provided in large DC machines to neutralize:
(A) Cross-magnetizing effect of armature reaction (B) Demagnetizing effect of armature reaction (C) Commutation sparks (D) Eddy currents

Q36. A 220V DC shunt motor has Ra = 0.5 Ω. At Ia = 20A, back EMF is?
(A) 200V (B) 210V (C) 220V (D) 230V

Q37. 4-pole, wave-wound DC generator with 200 conductors, flux 0.02Wb, 1500 RPM. Eg is?
(A) 100V (B) 200V (C) 400V (D) 800V

Q38. DC series motor torque is 20 Nm at 10A. At 20A (linear magnetic region), torque is?
(A) 20 Nm (B) 40 Nm (C) 80 Nm (D) 10 Nm

Q39. A DC motor runs at 1000 RPM with Eb = 200V. If Eb drops to 190V (flux constant), speed is?
(A) 950 RPM (B) 1000 RPM (C) 1050 RPM (D) 1100 RPM

Q40. Mechanical power developed by a DC motor is max when back EMF is?
(A) V (B) V/2 (C) V/√2 (D) 0

Q41. DC generator terminal voltage is 200V, Ia = 10A, Ra = 1 Ω. Generated EMF is?
(A) 190V (B) 200V (C) 210V (D) 220V

Q42. Number of parallel paths in a 6-pole simplex lap winding is?
(A) 2 (B) 4 (C) 6 (D) 12

Q43. A 3-phase, 415 V, 50 Hz, star-connected induction motor has a stator-to-rotor effective turns ratio of 2: 1. When the rotor is blocked (at standstill), the short-circuit impedance referred to the stator is $0.2 + j1.5\ \Omega$ per phase. Neglecting stator resistance and magnetizing current, what is the magnitude of the starting current drawn from the supply when direct-on-line (DOL) starting is applied?

(A) 80.2 A (B) 138.3 A (C) 239.6 A (D) 415.0 A

Q44. For a 3-phase induction machine to operate in generating mode, the slip (s) must be:
(A) s = 1 (B) 0 < s < 1 (C) s < 0 (negative) (D) s > 1

Q45. The blocked-rotor test in an induction motor is analogous to which transformer test?
(A) Open circuit test (B) Short circuit test (C) Back-to-back test (D) Polarity test

Q46. The no-load test of an induction motor is used to determine:
(A) Core loss and friction/windage loss (B) Stator copper loss
(C) Rotor copper loss (D) Maximum torque

Q47. A 3-phase induction motor operates from a 50 Hz supply. If the motor is running at 720 RPM and the frequency of the induced rotor currents is exactly 2 Hz, how many poles does this machine have?
(A) 4 poles (B) 6 poles (C) 8 poles (D) 10 poles

Q48. A 3-phase wound-rotor (slip-ring) induction motor is driving a constant torque load. It is observed that the motor develops its maximum (breakdown) torque at a slip of 0.1. If the total rotor circuit resistance is exactly tripled by inserting external resistors via the slip rings, what will be the new slip at which maximum torque occurs, and what happens to the starting torque?
(A) $s_m = 0.3$, and starting torque decreases. (B) $s_m = 0.3$, and starting torque increases.
(C) $s_m = 0.033$, and starting torque increases. (D) $s_m = 0.1$, and starting torque remains constant.

Q49. The torque-speed characteristic of an induction motor near synchronous speed is approximately:
(A) Parabolic (B) Hyperbolic (C) Linear (D) Exponential

Q50. A 4-pole, 50 Hz, 3-phase induction motor is operating at a full-load slip of 4%. What is the speed of the rotor's magnetic field with respect to the stationary stator structure?
(A) 60 RPM (B) 1440 RPM (C) 1500 RPM (D) 1560 RPM

Q51. If a 50Hz motor runs at 1440 RPM, the slip is?
(A) 0.02 (B) 0.04 (C) 0.06 (D) 0.08

Q52. Rotor frequency of a 50Hz induction motor running at 4% slip is?
(A) 2 Hz (B) 4 Hz (C) 50 Hz (D) 1250 Hz

Q53. Rotor input power is 10 kW, slip is 3%. Rotor copper loss is?
(A) 30 W (B) 300 W (C) 3000 W (D) 9700 W

Q54. 6-pole, 60Hz induction motor has 4% slip. Rotor speed is?
(A) 1200 RPM (B) 1152 RPM (C) 1000 RPM (D) 1440 RPM

Q55. Mechanical power developed if rotor input is 10kW and slip is 5% is?
(A) 500 W (B) 9.5 kW (C) 10 kW (D) 10.5 kW

Q56. A 3-phase squirrel cage induction motor draws a short-circuit (standstill) current equal to 5 times its full-load current when started Direct-On-Line (DOL). If the full-load slip is 4%, what is the approximate ratio of starting torque to full-load torque if the motor is started using a star-delta starter?
(A) 0.33 (B) 0.66 (C) 1.00 (D) 3.00

Q57. The frequency of the EMF generated by an alternator is directly proportional to:
(A) Number of poles only (B) Speed of the rotor only
(C) Both number of poles and speed (D) Excitation current

Q58. Which type of rotor is used in high-speed alternators (e.g., steam turbines)?
(A) Salient pole type (B) Cylindrical (non-salient) pole type
(C) Squirrel cage type (D) Slip ring type

Q59. In predicting the voltage regulation of a salient-pole synchronous generator, the EMF (Synchronous Impedance) method typically yields a value higher than the actual regulation. What is the fundamental physical reason for this "pessimistic" nature?

(A) It ignores the effect of armature resistance, which causes a larger perceived voltage drop.
(B) It assumes the magnetic circuit is linear and ignores the effects of magnetic saturation under loaded conditions.
(C) It vectorially adds the field MMF and armature MMF instead of their respective induced voltages.
(D) It assumes the leakage reactance of the machine is zero at full load.

Q60. The Potier triangle of a 3-phase, star-connected synchronous machine is drawn using a zero power factor (ZPF) test conducted at a phase current of 50 A. If the vertical side of the constructed Potier triangle measures 40 V, what is the Potier leakage reactance (X_p) per phase?

(A) 0.4 Ω (B) 0.8 Ω (C) 1.25 Ω (D) 1.5 Ω

Q61. In an alternator, a lagging power factor load causes an armature reaction that is:

(A) Cross-magnetizing (B) Magnetizing (C) Demagnetizing (D) Zero

Q62. What is the effect of a purely leading power factor load on the armature reaction of an alternator?

(A) Cross-magnetizing (B) Magnetizing (aiding main flux)
(C) Demagnetizing (D) Distorting

Q63. Damper windings are used in synchronous generators to:

(A) Increase voltage (B) Improve power factor
(C) Prevent hunting (oscillations) (D) Reduce eddy currents

Q64. A 4-pole synchronous generator is mechanically coupled to a 6-pole, 50 Hz induction motor. If the induction motor drives the generator at a full-load slip of 4%, what is the exact frequency of the voltage generated by the synchronous machine?

(A) 32 Hz (B) 33.3 Hz (C) 48 Hz (D) 50 Hz

Q65. Coil span is 150 electrical degrees. Pitch factor Kp is?

(A) 0.866 (B) 0.966 (C) 0.707 (D) 1.0

Q66. A 3-phase, star-connected cylindrical rotor alternator has a synchronous reactance of 0.75 pu and negligible armature resistance. If it delivers rated current at unity power factor to a 1.0 pu voltage bus, what is its percentage voltage regulation?

(A) 0% (B) 25% (C) 50% (D) 75%

Q67. 3-phase, 8-pole alternator has 72 slots. Slot angle in electrical degrees is?

(A) 10° (B) 15° (C) 20° (D) 30°

Q68. A 4-pole alternator is driven at a constant speed of 1500 RPM. Due to the physical shape of the rotor pole shoes, the air-gap flux density contains a prominent 5^{th} space harmonic. What is the frequency of the EMF induced in the stator winding strictly by this 5^{th} harmonic flux?

(A) 50 Hz (B) 150 Hz (C) 250 Hz (D) 7500 Hz

Q69. Distribution factor for 3 slots per pole per phase is?
(A) 0.96 (B) 0.9 (C) 0.866 (D) 1.0

Q70. An alternator delivers 100A at 0.8 pf lag. Active power per phase (Vph=230V) is?
(A) 18.4 kW (B) 23 kW (C) 55.2 kW (D) 230 kW

Q71. Which of the following devices is a unipolar, voltage-controlled device?
(A) BJT (B) SCR (C) Power MOSFET (D) GTO

Q72. An SCR is turned ON by applying a:
(A) Positive pulse to the gate (B) Negative pulse to the gate
(C) Positive pulse to the cathode (D) Negative voltage to the anode

Q73. Which terminal is absent in a DIAC compared to a TRIAC?
(A) Anode 1 (B) Anode 2 (C) Gate (D) Cathode

Q74. For an SCR, the relation between Latching current (IL) and Holding current (IH) is typically:
(A) $I_L < I_H$ (B) $I_L = I_H$ (C) $I_L > I_H$ (D) $I_L = 0$

Q75. An SCR has a maximum specified di/dt rating of 50 A/μs. It is used in a circuit with a stiff DC source of 200 V and negligible internal resistance. What is the absolute minimum value of series inductance (L) required to protect the SCR from di/dt failure during turn-on?
(A) 2 μH (B) 4 μH (C) 8 μH (D) 10 μH

Q76. The main application of a TRIAC is in:
(A) AC voltage control (e.g., fan regulators) (B) High frequency DC-DC converters
(C) HVDC transmission (D) Rectification only

Q77. If a reverse voltage is applied across a conducting SCR, it will:
(A) Turn off immediately (B) Continue conducting
(C) Undergo reverse recovery and then turn off (D) Turn into a short circuit

Q78. Power MOSFET has R_DS(on) = 0.2 Ω. Conduction loss at 10A is?
(A) 2 W (B) 10 W (C) 20 W (D) 40 W

Q79. An IGBT has V_CE(on) = 2V. Average power loss for continuous 50A is?
(A) 25 W (B) 50 W (C) 100 W (D) 200 W

Q80. If Latching current is 50mA, Holding current is typically around?
(A) 10mA (B) 20mA (C) 50mA (D) 100mA

Q81. An SCR is connected in series with a 10 Ω load and 100V DC. Steady state current is?
(A) 1A (B) 10A (C) 100A (D) 0A

Q82. The turn-off snubber circuit connected across a power IGBT in a high-frequency converter is primarily intended to:

(A) Limit the rate of rise of current (di/dt) through the device.
(B) Limit the rate of rise of voltage (dv/dt) across the device.
(C) Actively sweep out minority carriers to reduce the current tail.
(D) Prevent latch-up of the parasitic thyristor during conduction.

Q83. A diode has a reverse recovery time of 2 μs and rate of fall of current is 20 A/μs. Peak reverse current is?

(A) 10A (B) 20A (C) 40A (D) 80A

Q84. A power BJT has common base gain alpha = 0.98. The beta is?

(A) 0.02 (B) 49 (C) 50 (D) 98

Q85. A thyristor has a turn-on time of 5 μs. If forced commutated, ideal min. pulse width is?

(A) 1 μs (B) 2.5 μs (C) >5 μs (D) 0 μs

Q86. In a single-phase fully controlled rectifier, if the firing angle is increased, the average output voltage:

(A) Increases (B) Decreases (C) Remains constant (D) Becomes AC

Q87. A buck converter is supplied by a 40 V DC source and regulates the output to 10 V. If the converter operates in continuous conduction mode and supplies an average load current of 8 A, what is the average current flowing through the freewheeling diode?

(A) 2 A (B) 4 A (C) 6 A (D) 8 A

Q88. For a buck-boost converter operating at 20 kHz with a duty cycle of $D = 0.4$ and a load of $R = 50\ \Omega$, what is the critical inductance boundary to ensure continuous conduction mode?

(A) 250 μH (B) 450 μH (C) 900 μH (D) 1.2 mH

Q89. The primary function of a freewheeling diode in a controlled rectifier with an RL load is to:

(A) Increase the ripple (B) Turn on the SCR faster
(C) Prevent negative voltage spikes at the output (D) Act as a voltage multiplier

Q90. A buck converter operating at 50 kHz is supplied from a 20 V source. The output is required to be 10 V across a 10 Ω load. What is the critical value of inductance (L_c) required to keep the inductor current strictly continuous?

(A) 25 μH (B) 50 μH (C) 100 μH (D) 200 μH

Q91. In a single-phase fully controlled rectifier with a highly inductive load, inversion (power flowing back to AC source) takes place when:

(A) Firing angle < 90 degrees (B) Firing angle = 90 degrees
(C) Firing angle > 90 degrees (D) It is not possible

Q92. In an ideal boost converter, $V_{in} = 15$ V, $V_{out} = 60$ V, $R = 10\ \Omega$, and $f = 50$ kHz. What is the average current flowing through the inductor?

(A) 6 A (B) 12 A (C) 24 A (D) 30 A

Q93. Buck converter: Vs = 50V, Duty cycle = 0.4. V_out is?
(A) 10V (B) 20V (C) 30V (D) 50V

Q94. Boost converter: Vs = 20V, Duty cycle = 0.6. V_out is?
(A) 12V (B) 32V (C) 50V (D) 120V

Q95. Buck-Boost converter: Vs = 12V, Duty cycle = 0.5. Magnitude of V_out is?
(A) 6V (B) 12V (C) 24V (D) 36V

Q96. 1-ph fully controlled rectifier, V_m=314V, firing angle 0°. Average V_out is?
(A) 100V (B) 200V (C) 314V (D) 628V

Q97. 1-ph fully controlled rectifier, highly inductive load, firing angle 60°. Normalized V_out is?
(A) 0.5 (B) 0.866 (C) 1.0 (D) 0

Q98. Buck converter: V_out = 5V, Vs = 12V. Duty cycle is?
(A) 0.416 (B) 0.5 (C) 0.6 (D) 0.833

Q99. Boost converter output is 40V, input is 10V. Duty cycle is?
(A) 0.25 (B) 0.5 (C) 0.75 (D) 1.0

Q100. 1-ph half-wave rectifier, resistive load, firing angle 90°. V_m=100V. V_avg is?
(A) 15.9V (B) 31.8V (C) 50V (D) 100V

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