

राष्ट्रीय प्रौद्योगिकी संस्थान नागालैंड
NATIONAL INSTITUTE OF TECHNOLOGY NAGALAND
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Prof. R. Kumar
Registrar (i/c)

Ref: NIT-N/ADMN/ REG/2022/04-002

Date: 13/04/2022

General Instructions for candidates shortlisted for appearing in the Written Examination for the Post of Technical Assistant (Physics) with Specialization in Condensed Matter Physics and Electronics in response to Advt. No. NIT-N/RECT-NT/2022/01 dtd. 05/01/2022:

1. In addition to the conditions stipulated as a part of general information, which were already provided in the Advertisement of the Institute as above, the following conditions shall also be adhered which may kindly be noted by all concerned.
2. In accordance with the communication Ref. F.No.35 – 4/2016–TS.III dated. 11/12/2019 of Ministry of Education, Government of India, Written Examination for the Post of Technical Assistant (Physics Discipline with the Specialization in Condensed Matter Physics and Electronics) will only be conducted and no Personal Interviews shall be conducted under the extant rules.
3. The Written Examination pattern, syllabus and the test modalities for the Post of Technical Assistant (Physics Discipline with the Specialization in Condensed Matter Physics and Electronics) shall be as under:

Sl No	Post and Discipline / Specialization	Examination Pattern and Evaluation
1	Technical Assistant (Physics Discipline with the Specialization in Condensed Matter Physics and Electronics)	<p>The Written Examination will be of two to three hours duration. The pattern of the exam shall be of Multiple Choice Questions (MCQ) and/or Descriptive type. The question paper consists of three parts viz.</p> <ol style="list-style-type: none">1. PART-A - General Physics - 20 Marks2. PART B - Electronics - 40 Marks3. PART C - Condensed Matter Physics - 40 marks <p>The candidate shall have to score minimum of 25 marks out of 40 marks in any one of the PART B- Electronics or Part C-Condensed Matter Physics and need to score an aggregate of 60 marks out of 100 marks in PART-A, PART B- and PART-C combined together.</p> <p>The selection of candidate for offering Appointment is based upon the performance in Written Examination. The minimum marks required for consideration for offering the appointment is 60%. If more than one candidate scores same marks, the rank will be decided based on an additional fresh test on General Physics of 1 hour duration.</p>

3.1. Syllabus for Technical Assistant (Physics):

PART-A – General Physics

- a) **Quantum Mechanics:** Physical basis of quantum mechanics; uncertainty principle; Schrodinger equation; one, two and three dimensional potential problems; particles in a box, harmonic oscillator, hydrogen atom; linear vectors and operators in Hilbert space; angular momentum and spin; addition of angular momenta; time independent perturbation theory; elementary scattering theory.
- b) **Electromagnetic Theory:** Solution of electrostatic and magneto static problems including boundary value problems; dielectrics and conductors; Biot-Savart's and Ampere's laws; Faraday's law; Maxwell's equations; scalar and vector potentials; Coulomb and Lorentz gauges; Electromagnetic waves and their reflection, refraction, interference, diffraction and polarization. Poynting vector, Poynting theorem, energy and momentum of electromagnetic waves; radiation from a moving charge.
- c) **Optics:** Reflection, Refraction, Fermat principle, focal plane, Image formation and magnification, F-number, Depth of the focus and depth of the field, aberrations, Snell's law, Polarization, collimation, optical components and their geometry effect on ray propagation. Basics of Interference.
- d) **LASER:** Einstein's quantum theory of radiation; Boltzmann distribution, Population inversion, Rate equations, Three level and four level lasers; Issues in designing a laser; Pumping mechanisms; Laser Cavity, Longitudinal and Transverse Modes, Mode Selection, Laser amplification. Different types of Laser.

PART B- Electronics

- a) **Analog Electronics:** Semiconductor Devices : Structure of Atom - Atomic Number - Valence Electrons - Bonding in Conductors - Insulators - Semiconductors - Energy Band Diagram of Conductors - Insulators - Semiconductors - Intrinsic Semiconductor - Extrinsic Semiconductor - P Type Semiconductor - N type Semiconductor - Carrier Life Time.

Theory of PN Junction Diode - Energy Band Structure - Diode Current Equation - Diode Resistance - Depletion Capacitance - Diffusion Capacitance - Effect of Temperature – PN Junction Diode as a Rectifier - Zener Diode - Avalanche Break Down - Zener Break Down - Zener Diode as a Voltage Regulator.

Operation of PNP & NPN Transistor - CB , CE , CC Configuration and Characteristics - Transistor as an Amplifier. Construction - Operation - Output & Transfer Characteristics of P Channel & N Channel JFET - Characteristic Parameters of the JFET - Biasing the FET - Comparison of JFET & BJT - Comparison of P Channel & N Channel JFET - Applications of JFET - JFET as a Voltage Variable Resistor.

Construction, Operation, Output & Transfer Characteristics of P Channel & N Channel Depletion MOSFET - Construction, Operation, Output & Transfer Characteristics P Channel & N Channel Enhancement MOSFET - Biasing the MOSFET - Comparison of P Channel MOSFET with N Channel MOSFET - Comparison of JFET with MOSFET – Handling Precautions for the MOSFET.

- b) **Digital Electronics:** NUMBER SYSTEMS : Binary Signals – Binary Number System – Decimal Number System - Octal Number System – Hexadecimal Number System – Conversion from One Number System to Another Number System - BCD – Gray code – Excess – 3 Code – ASCII code. BOOLEAN ALGEBRA : Binary Addition, Subtraction, Multiplication & Division - 1's and 2's Complement Subtraction - 9's & 10's Complement Subtraction - Basic laws of Boolean Algebra - Duality Theorem – De Morgan's Theorem - Sum of Products – Product of Sum - Two Variable, Three Variable & Four Variable Karnaugh Maps. COMBINATIONAL ELEMENTS : Logic Gates : AND, OR, NOT, EX-OR, EXNOR, NAND & NOR - Logic Gates using Discrete Components - NAND & NOR as Universal Gates - Half Adder and Full Adder – Half and Full Subtractor - Encoder - Decoder – Multiplexer - Demultiplexer - Implementation using 74147, 7442, 74153 & 74155 IC's.

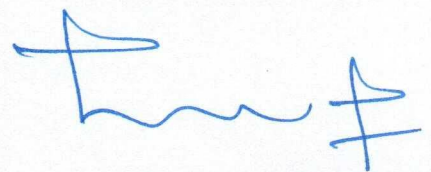
PART C-Condensed Matter Physics

Elements of crystallography; diffraction methods for structure determination; bonding in solids; elastic properties of solids; defects in crystals; lattice vibrations and thermal properties of solids; free electron theory; band theory of solids; metals, semiconductors and insulators; transport properties; optical, dielectric and magnetic properties of solids; elements of superconductivity.

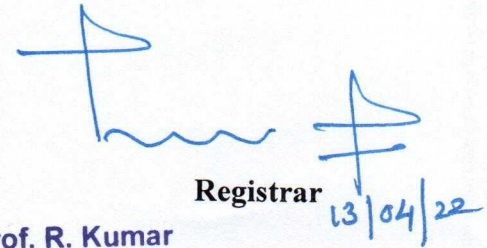
Magnetic properties of solids. Diamagnetism, Langevin equation. Quantum theory of para-magnetism. Curie law. Hund's rules. Para-magnetism in rare earth and iron group ions. Elementary idea of crystal field effects. Ferromagnetism. Curie-Weiss law. Heisenberg exchange interaction. Mean field theory. Anti-ferromagnetism. Neel point. Other kinds of magnetic order. Nuclear magnetic resonance

4. General Instructions:

- a) The list of the shortlisted candidates for appearing the scheduled written test as in para 3 above for the above posts have been uploaded on the Institute website. However, if any candidate whose name has appeared in the said list is unable to receive the intimation of the examination through e-mail or speed post, he/ she may appear for the test with the proof of his/ her identity along with a copy of the application/ copy of the DD / proof of payment made for making such application against the above advertisement for the said post of Technical Assistant (Physics):.
- b) No request for change of venue for the above written examination/ date shall be considered under any circumstances.
- c) The shortlisted candidates are to abide by the Protocol as well as SOP in connection with COVID-19 as adopted by the Government of Nagaland as on date of their travel and appearing for the afore mentioned test in this Institute.



- d) The candidates needing special assistance, are required to inform the undersigned through e-mail registrar@nitnagaland.ac.in or over Phone No. 09840778590/09443208298 or over Phone No. 09840778590/09443208298 or Dr. J. Arul Valan, Assistant Professor & HoD, Data Centre, NIT Nagaland through e-mail: valan@nitnagaland.ac.in over Phone No. 09443109434 at least 5 days before the scheduled date of examination so that necessary arrangements can be made.
- e) Electronic devices of any form shall not be allowed during the Examination. The decision of the Institute Authorities about the nature of such electronic devices are final and binding upon the candidates appearing the examination.
- f) The candidates those are currently serving in the State Government, Central Government, Quasi-Government, Public Sector Undertakings/ Units/ Enterprises, Autonomous Institutes of State and Central Governments, etc., are required to produce "No Objection Certificate (NOC)" from their Head of the Institution for attending the written examination otherwise they will not be eligible to attend the written examination.



Registrar 13/04/22

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