

Digital University Research Aptitude Test (DRAT) - 2024

Date: 8th June 2024

Total Marks: 70

Time: 120 mins

Section A (DRAT-Common or DRAT-C) is mandatory for all the candidates. The individual program specific test papers under Section B will follow after the completion of Section A. Candidates applying for a PhD at DUK recognized research centers (CTCRI) are required to appear for the DRAT common (Section A-DRAT Common) examination only.

Section A_DRAT-Common

Syllabus	No. of questions	Approximate Time	Marks
Quantitative Aptitude: Data interpretation: Data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables. Numerical computation and estimation: Ratios, percentages, powers, exponents and logarithms, permutations and combinations, summations and series, Mensuration and Geometry	10	15 mins	10
Analytical Aptitude: Logical methods, Deduction and induction, analogy, numerical relations, and reasoning	10	15 mins	10
Research aptitude: Types and characteristics of research, methods of research, qualitative and quantitative methods, steps of research	10	15 mins	10
English comprehension	5	15 mins	5

School of Computer Science & Engineering

Section B_DRAT-SoCSE

Syllabus	No. of questions	Approximate Time	Marks
Basic Engineering Mathematics: Discrete Mathematics, Linear Algebra, Calculus, Probability and Basic Statistics Computer Science: Digital Logic, Computer Organization and Architecture, Programming and Data Structures, Algorithms, Theory of Computation, Operating System, Databases, Computer Networks and Security.	35	60 mins	35

School of Electronic Systems & Automation

Note: The candidate can choose Test I/Test II/Test III after completing Section A depending on his/her research interests.

Section B_DRAT-SoESA-Test I (For research areas: Energy Storage, and Conversion, Gas Sensors, Graphene and 2D Materials, Wearable Sensors, FlexibleElectronics, Nanoelectronics, IoT)

Syllabus	No. of questions	Approximate Time	Marks
Basics Electronics, Classification and properties of materials, material characterization techniques, Fundamental concepts of electrochemistry	35	60 mins	35

Section B_DRAT-SoESA-Test II (For research areas: Electronic Instrumentation, Applied Electronics, Interface Circuits)

Section B Syllabus	No. of questions	Approximate Time	Marks
Sensors for temperature measurement, diode, zener diode, Op-amps and typical Op-amp-based circuits, ADC and DAC	35	60 mins	35

Section B_DRAT-SoESA-Test III (For research areas: CMOS technology and basic analog circuit components)

Section B Syllabus	No. of questions	Approximate Time	Marks
Introduction to CMOS technology and basic analog circuit components; primary functions of CMOS transistors, including the impact of threshold voltage (V_{th}), body effect, and channel length modulation; current mirrors and amplifiers, highlighting the role of current mirrors, the significance of transconductance (g_m), and the advantages of CMOS differential amplifiers; noise and performance aspects through the comparison of NMOS and PMOS transistors, power supply rejection ratio (PSRR), and gate leakage current effects; advanced amplifier designs such as cascode and folded cascode amplifiers, CMOS operational amplifiers, and the importance of common-mode rejection ratio (CMRR) in differential amplifiers; specialized CMOS components like phase-locked loops (PLL), voltage-to-current converters, and CMOS current sources; parasitic capacitance and its impact on frequency response, the Miller effect on bandwidth, and the effects of thermal noise; layout and matching techniques to minimize mismatch in CMOS circuits and the significance of matching characteristics in differential pairs; analog-to-digital converters (ADCs) focusing on different architectures, conversion times, resolution calculations, sigma-delta ADC advantages, and the role of integrators in dual-slope ADCs; digital-to-analog converters (DACs), including binary-weighted resistor networks, R-2R ladder designs, and their applications in digital signal processing	35	60 mins	35

School of Digital Sciences

Note: The candidate can choose Test I or Test II or Test III after completing Section A depending on his/her research interests.

Section B_DRAT-SoDS-Test I (For research areas: Computational Dynamical Systems, Nonlinear Dynamics and Chaos, Neurodynamics, Network of coupled oscillators and their dynamics, Discrete mappings and bifurcation theory)

Syllabus	No. of questions	Approximate Time	Marks
Calculus, Linear Algebra, differential equations, numerical methods, programming language(MATLAB/Python/C, C++)	35	60 mins	35

Section B_DRAT-SoDS-Test II (For research area: Computational Chemical Biology):

Syllabus	No. of questions	Approximate Time	Marks
Bioinformatics-databases, omics data analysis, medicinal chemistry, molecular biology,retrosynthesis, computer-aided drug discovery, sensors and probes, machine learning	35	60 mins	35

Section B_DRAT-SoDS-Test III (For research area: Computational Neuroscience):

Syllabus	No. of questions	Approximate Time	Marks
Mathematics fundamentals, Neuroscience basics, Computer basics & programming, Electronics basics, Chemistry basics.	35	60 mins	35

School of Informatics

Section B_DRAT-SoI

Syllabus	No. of questions	Approximate Time	Marks
Fundamentals of Ecology, Terrestrial ecosystem, Biodiversity and conservation, SpatialInformatics, Ecological Data Analysis	35	60 mins	35

School of Digital Humanities & Liberal Arts

Section B DRAT-SODiHLA

Syllabus	No. of questions	Approximate Time	Marks
Management Science- LPP, Sensitivity Analysis, Transportation Assignment problems, Queingtheory, PERT/CPM, Inventory models, Game theory, Decision Trees	10	15	10
Business Environment - Liberalisation, privatisation, globalisation, industrial policy andindustrialisation trends	10	15	10
Business Statistics	5	10	5
Business Policy and Strategic management	5	10	5
Research Methodology	5	10	5