Syllabus – PhD Entrance Exam 2024-25

1. There will be two components in the syllabus of the entrance exam for admission in the PhD program of Shri Vishwakarma Skill University.

Part – I: Research Methodology (50%). Common for all candidates.

Part -II: Discipline/subject specific (50%).

Time duration for each part shall be 1 hour. Syllabus for both Part I and Part II is given in Annexures 1, 2, 3 and 4.

2. Candidates scoring 50 % marks (total in Part - I and Part -II) in the entrance test are eligible to be called for the interview.

3. A relaxation of 5 % marks will be allowed in the entrance examination for the candidates belonging to SC/ST/OBC/differently-abled category, Economically Weaker Section (EWS), and other categories of candidates as per the decision of the Commission from time to time.

Annexure-B

SYLLABUS FOR PHD ENTRANCE

TEST PART-1 (COMMON FOR ALL)

Research Methodology

Basic statistics: Sources and type of data: quantitative and qualitative data: diagrammatic and graphical representation of data. Mean, median, mode, geometric mean, harmonic mean and other measures of central tendency, measure of dispersion. mean deviation. quartile deviation, standard deviation. variance, coefficient of variation, skewness, kurtosis. moments, correlation and regression, elementary probability theory. Baye's theorem. Poisson, Normal and Binomial distributions.

Research Methodology: Nature and Scope of Research Methodology. Problem Formulation and Statement, Research Objectives: Research Process; Research Designs Exploratory. Descriptive and Experimental; Hypothesis formulation and testing of hypothesis. Sampling and Sampling Design Methods. Data Collection methods, tools and techniques Observational and Survey Methods; Questionnaire and Interviews. Data analysis techniques.

Aptitude: Understanding the Structure of Argument. Evaluating and distinguishing Deductive and Inductive Reasoning. Analytical Reasoning. Verbal Analogies, Word Analogy Applied Analogy. Verbal Classification Numerical computation & estimation numerical reasoning and data interpretation.

Annexure – C

Syllabus for Entrance Test

Part – 2 (Domain Specific)

Skill Faculty of Engineering and Technology

Skill Department of Automotive

Studies Automotive fundamentals

Power Cycles, Engine Control, Ignition System. Drive Train. Transmission. Brakes. Steering System. Battery. Starting System. Automotive Instrumentation and Communication, Vehicle Motion Control. Automotive Diagnostics, Expert Systems, Industrial automation, Mechatronics systems. Alternative Vehicles.

Mechanical engineering science

Fluid (Pneumatic and hydraulic) properties, flow of incompressible fluids, fluid statics, volume analysis of mass, momentum and energy. continuity equation. Thermodynamic system and processes, behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes. Modes of heat transfer, conduction, convection and radiation, electrical analogy, steady and unsteady heat transfer, thermal boundary layer, heat exchanger performance. LMTD and NTU methods. Power engineering: compressors. Refrigeration and air-conditioning: Turbomachinery: velocity diagrams, impulse and reaction turbines

Design and materials fundamentals

Principal stresses and strains, stress-strain relations, uniaxial loading. thermal stresses, shear force and bending moment, torsion of circular shafts, structure and properties of engineering materials, Ferrous and non-ferrous materials, Heat treatments, TTT curve, polymers and composites, smart materials, material testing with UTM, hardness and impact strength. Dynamic analysis of linkages, cams, gears and gear trains, flywheels and governor, gyroscope. Design of static and dynamic loading, failure theories, design of joints, transmission drives, springs and bearings, basic criteria of selection of

material, factor of safety. Tribology of materials, dry sliding and erosion wear.

Manufacturing Science

Fundamentals of manufacturing processes, Casting, forming and joining processes, metal working, Hot and cold working: forging, rolling, extrusion, drawing, sheet metal, machine tools, tool geometry and materials, economies of machining, non-traditional machining processes, micro machining, work holding devices, jigs and fixtures, dies and punches. Powder Metallurgy, metal powders, compaction and sintering, powder forging. CIM, CAD/CAM. CMP. cellular manufacturing. NC. CNC, DNC. Robotics. FMS, Manufacturing technologies strategies and selection, metrology and inspection.

Industrial management

Production Planning and Control. Forecasting models, aggregate production planning. scheduling, materials requirement planning. Inventory Control, Operations Research. Linear programming, simplex, transportation and assignment model, network flow models, simple queuing models, PERT and CPM.

Skill Department of Computer Science Engineering

(CS/IT) Discrete Structure

Sets, functions, relations, counting; generating functions, recurrence relations and their solutions; algorithmic complexity, growth of functions and asymptotic notations. Programming,

Data Structures and Algorithms

Data types, control structures, functions/modules, object-oriented programming concepts: sub- typing, inheritance, classes and subclasses, etc. Basic data structures like stacks, linked list. queues, trees, binary search tree, AVL and B+ trees; sorting, searching, order statistics, graph algorithms, greedy algorithms and dynamic programming

Computer System Architecture

Boolean algebra and computer arithmetic, flipflops, design of combinational

and sequential circuits, instruction formats, addressing modes, interfacing peripheral devices, types of memory and their organization, interrupts and exceptions.

Operating Systems

Basic functionalities, multiprogramming; multiprocessing, mút threading, timesharing, real- time operating system; processor management, process synchronization, memory management, device management, File management, security and protection; case study: Linux.

Software Engineering

Software process models, requirement analysis, software specification, software testing, software project management techniques, quality assurance.

DBMS and File Structures

File organization techniques, database approach, data models, DBMS architecture; data independence, E-R model, relational data models, SQL, normalization and functional dependencies.

Computer Networks

ISO-OSI and TCP/IP models, basic concepts like transmission media, signal encoding, modulation techniques, multiplexing, error detection and correction; overview of LAN/MAN/ WAN; data link, MAC, network, transport and application layer protocol features; network security.

Artificial Intelligence and Machine Learning

Uninformed and informed search techniques; Knowledge and Reasoning; Supervised, unsupervised and Reinforced machine learning methods, Parametric and non-parametric methods, Overfitting/under fitting & Regularization, Curse of Dimensionality. Mixture Models. Basics of image processing, enhancement, features, matching.

Optimization: Linear Programming

Mathematical Model, Graphical Solution, Simplex and Dual Simplex Method, Sensitive Analysis; Integer Programming, Transportation and Assignment Models, PERT-CPM: Diagram Representation, Critical Path Calculations,

Resource Levelling, Cost Consideration in Project Scheduling.

Computer Graphics & Image Processing

Video-Display Devices, Raster-Scan and Random-Scan Systems; Graphics Monitors, Input Devices, Points and Lines; Line Drawing Algorithms, Mid-Point Circle and Ellipse Algorithms; Scan Line Polygon Fill Algorithm, Boundary-Fill and Flood-Fill, 2-D and 3-D Geometrical Transforms

Elements of digital image processing, Image model, Sampling and quantization. Discrete Fourier Transform, Discrete Cosine Transform, Haar Transform, Enhancement by point processing, Spatial filtering, Dilation and Erosion

Skill Department of Industry 4.0

Networks: Network graphs: matrices associated with graphs; incidence, fundamental cut set and Fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition. Thevenin and Norton's maximum power transfer. Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations: time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks.

Electronic Devices: Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED. p-1-n and avalanche photo diode, Basics of LASERS. Device technology: integrated circuits fabrication process oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process.

Analog Circuits: Small Signal Equivalent circuits of diodes, BJTS, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and

multi-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators: criterion for oscillation: single-transistor and op- amp configurations. Function generators and wave-shaping circuits. 555 Timers. Power supplies.

Digital circuits: Boolean algebra, minimization of Boolean functions; logic gates, digital IC families (DTI. TTL, ECI, MOS. CMOS). Combinatorial circuits: arithmetic circuits, code converters. multiplexers, decoders. PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift- registers. Sample and bold circuits, ADX DACS Semiconductor memories, Microprocessor (8085): architecture, programming, memory and 1-4) interfacing.

Signals and Systems: Definitions and properties of Laplace transform, continuous-time and discrete- time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems, definitions and properties, causality, stability. impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems.

Control Systems: Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci. Routh-Hurwitz criterion. Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

Communications: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-

to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude. phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA. FDMA and CDMA and GSM.

Electromagnetics: Elements of vector calculus: divergence and curl; Gauss' and Stokes' theorems, Maxwell's equations: differential and integral forms. Wave equation, Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity, skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; impedance matching: S parameters, pulse excitation.

Waveguides: modes in rectangular waveguides: boundary conditions, cut-off frequencies: dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas: Dipole antennas, radiation pattern; antenna gain.

Skill Department of Green Technology

For Candidates having graduation/post-graduation in Mechanical Engineering, the Syllabus of Ph.D.

Thermodynamics: Thermodynamic systems and processes; properties of pure substances, behaviour of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, Heisler's charts;

thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes, effect of turbulence; heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan-Boltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis.

Compressors and Heat Engines: Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles.

Refrigeration and air-conditioning: Vapour and gas refrigeration and heat pump cycles; multistage refrigeration systems, vapour absorption refrigeration systems, properties of moist air, psychrometric chart, basic psychrometric processes.

Hydraulic Machines: Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines.

Solar Thermal: Solar radiation, Flat Plate Collectors; Concentrating Collectors; Solar Air Heating System Solar Drying, Solar Cooker; Solar Pond, Solar Distillation, Solar Detoxification. Solar Cooling System, Central Receiver Systems, Parabolic Trough Systems, Solar Furnaces.

Non-conventional energy sources: wind energy, wind turbines, wind energy storage, geothermal energy, and ocean energy.

For Candidates having graduation/post-graduation in Electrical Engineering, the Syllabus of Ph.D.

Entrance Test is as follows: -

Basic Electrical and Circuit Analysis: AC and DC Circuit Analysis, series and parallel resonance, nodal analysis, mesh analysis, time domain and frequency domain analysis of simple RLC circuits, power factor, star and delta connected loads, thevenin theorem, Norton theorem, superposition theorem, maximum power transfer theorem, reciprocity theorem.

Electrical Machines: Transformers, D.C Machines: DC motor and DC generator, Induction Machines: Single phase and Three phase Induction Motor, Synchronous Machines: Synchronous motor and Synchronous generator, Industrial Applications of electrical machines.

Control Systems: Introduction to control systems, Mathematical Models of Physical Systems, Representation of Control Components, Time domain analysis and design specification of linear systems: Concepts of Stability and Routh Hurwitz Criterion, Root Locus Technique, Frequency Response Analysis and Stability Studies in Frequency Domain, Design and Compensation Technique, Introduction to State Variable Approach.

Power Systems: Per Unit system, Distribution systems, electrical design of overhead lines, mechanical design of overhead lines, insulators, insulated cables, transmission and performance, corona, inductive interference; short circuit analysis, protective relays, protective relaying schemes - protection of feeders & transmission lines, transformers and alternators, circuit interruption devices.

Power Electronics and Drives: Familiarization with semiconductor devices including Diode, Thyristor, BJT, MOSFET, IGBT, GTO, TRIAC, DIAC, Operation and analysis of: Uncontrolled and Controlled Rectifier, DC-DC Converters, Inverters, Cycloconverters, AC voltage Regulators, Different switching topologies, Basic applications of PE Converters in Home appliances & Industry, Drives for E-vehicles.

Skill Faculty of Management Studies and research

Skill Department of Tourism & Hospitality

Front Office: Evaluation and growth of hotel industry, products and services of hospitality industry, organizational structural, classification of hotels, star rating, organization of front office department, coordination of front office and other departments, room tariffs, reservations, registration, guest services, guest cycle, upselling and discounts, front office accounting, budgeting, yield management, forecasting, revenue management, crisis management, situation handling, complaint handling, hospitality marketing and research

Accommodation: Housekeeping organization, organizational structural, types of rooms, coordination of housekeeping department and other departments, control desk, duty roaster, work schedule, briefing and debriefing, lost & found, pest control, guest room cleaning services, cleaning public areas, cleaning science and principals, linen room, laundry system, stains and stain removal process, linen measurements, amenities and supplies, inventory control, par stock, budget, interior and exterior designing, modern trends in housekeeping and hotels, situation handling, complaint handling

Food & Beverage Service: Types of catering establishments, food and beverage service areas in a hotel and restaurant, service equipment and its use, care and maintenance, service organization, service personnel attitude and attributions, interdepartmental relationship, French classical menu, service methods, bar and bar operations, beverage temperatures, alcoholic and non-alcoholic beverages, menu management, Food and beverage control

Food Production: Culinary history, basic terminologies related to kitchen and bakery, kitchen equipment and hygiene, methods of cooking, fundamentals of food production, basic cuts, menu planning and development, food commodities, cold kitchen, starters, Sandwiches, historical background of baking, basic pastries, yeast dough products, cake making, International and Indian Cuisine – Major Ingredients, Dishes and broad overview, Cuisine of Haryana – Major delicacies & role of ingredients, HACCP Certification

Tourism and Airlines: Understanding concept of environment and relation between environment, tourism & hospitality, tourism concepts, tourism resources, type of tourism, tourism mix, tour & travel operations: role, scope & challenges, travel agency operations: tasks, functions & challenges, airline services: role, scope & challenges, guide & escorting services: tasks, functions & challenges, tourism & guest psychology, tourist decision making, sociological impacts of tourism, sports, hospitality & tourism, cargo handling, airport operations, aviation safety and security, customer service, aviation law and regulations, crisis management

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