SCHEME & SYLLABUS OF EXAMINATION OF PART–I FOR POST NO. 6

JUNIOR ENGINEER (POWER)

Part	Section	Subject/Syllabus	No. of questions	Maximum Marks	Qualifying Marks
			60	**180**	**72**
Part-I	Section 'A'	Reasoning/Quantitative Aptitude	20	60	
	Section 'B'	• **General Knowledge & General Knowledge of Rajasthan**: 1. Events of State, National and International importance 2. Geography and Natural Resources of India and Rajasthan 3. Agricultural, Social and economic development of India Rajasthan 4. Indian Medieval History, Indian struggle for Independence,, and History of Rajasthan 5. Culture and heritage of India and Rajasthan • **General Science:** 1. Elements, Mixtures and Compounds 2. Physical and Chemical Changes; Oxidation and Reduction: Catalysis 3. Metals and Non Metals 4. Acids, bases and Salts 5. Reflection of light and its laws, lenses,	30	90	

		human eye, defects of vision and its correction 6. Electric current, Electric potential, Ohms law, electric cell and Electric motor 7. Human Brain, hormones, human diseases and cure 8. Economic importance of animals and plants 9. Biomass, sources of energy, ecosystem, Mendel's Law of inheritance, chromosomes 10. Human blood groups, blood transfusion, Deficiency diseases and cure • **Basic Computer Skills:** 1. Introduction to Computers 2. Computer Systems 3. Uses of Computers 4. Introduction to the Internet & Search Engines, Internet Applications 5. Operating system, 6. MS Word Advance 7. Database Management System 8. MS Excel Advance 9. MS Power Point Basics 10. Microsoft Outlook-Basics			
	Section 'C'	**Language Comprehension** • **Hindi** 1. शब्द रचना: संधि एवं संधि विच्छेद, समास, उपसर्ग, प्रत्यय	10	30	

		2. **शब्द प्रकार:** तत्सम, तत्भव, अर्धतत्सम, देशज, विदेशी, संज्ञा, सर्वनाम, विशेषण, क्रिया, अव्यय			
		3. **शब्द ज्ञान:** पर्यायवाची, विलोम, शब्द युग्मो का अर्थभेद, वाक्यांश के लिए सार्थक शब्द, संश्रुततभिन्नार्थक शब्द, समानार्थी शब्द, उपयुक्त शब्द चयन, संबंधवाची शब्दावली			
		4. **शब्द शुद्धि**			
		5. **व्याकरणिक कोटियाँ:** परसर्ग, लिंग, वचन, पुरुष, काल, वृत्ति, पक्ष , वाच्य			
		6. **वाक्य रचना**			
		7. **वाक्य शुद्धि**			
		8. **विराम चिन्हो का प्रयोग**			
		9. **मुहावरे/ लोकक्तिया**			
		10. **पारिभाषिक शब्दावली: प्रशासनिक/ विविध**			
		• **English**			
		1. Use of articles and determiners			
		2. Tenses/ sequence of tenses			
		3. Active and passive voice			
		4. Direct and Indirect Narration			
		5. Use of Prepositions			
		6. Synonyms and antonyms			
		7. Comprehension of passage			
		8. Idioms and Phrases			
		9. Letter writing: Official, Demi-official. Circulars and Notices			

POST NO. 6 JUNIOR ENGINEER (POWER)

SCHEME OF EXAMINATION FOR PART-II

Part	Section	Subject	No. of Questions		Maximum Marks	
Part-II	Section 'A'	Electric Circuits: Elements in an Electrical circuit: R, L, C. Voltage and current sources (independent and dependent/controlled sources). DC circuits, KCL, KVL, Network theorems, Mesh and nodal analysis. Network graph, Step response in RL, RC, RLC circuits. Two port networks. Phasor analysis of AC circuits. Single phase and three-phase circuits. Power and Power factor in ac circuits. Resonance. Electromagnetic Fields: Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Bior-Savart's Law, Ampere's law, Curl, Faraday's law, Lorentz force, inductance, Magneto motive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations. Electrical Materials: Classification of materials; Structure-property Relations; Metals & Alloys, Ceramics, Polymers, Composites and Semiconductors. Atomic Structure & Interatomic Bonding: Fundamentals of Atomic Structure and Chemical Bonding: Atomic Bonding in Solids, Basics of Electrical,	90	50	270	150

Part	Section	Subject	No. of Questions		Maximum Marks	
		Dielectric and Magnetic properties of materials, Material Selection, Supeconductors.				
		Electrical Machines:				
		Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three phase transformers: connections, parallel operation; Auto-transformer and instrument transformers (CT/PT).				
		Electro-mechanical energy conversion principles: Force and EMF production in a rotating machine. DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Three phase induction motors: principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor tests, equivalent circuit, starting and speed control; Operating principle of single phase induction motors; Synchronous machines; cylindrical and salient pole machines, performance, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiepcy calculations of electric machines. Fractional-HP and Special Machines.				
		Power Systems:				
		Introduction to the basic structure of power system along with various power generation technologies, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators,				

Part	Section	Subject	No. of Questions	Maximum Marks
		Distribution systems, per-unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Introduction of power system relaying and principles of over current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion. Power system stability studies, Introduction to HVDC and FACTS.		
	Section 'B'	<u>Electrical Measurements and Instrumentation:</u> Basics of Measurement and Instrumentation, Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Calibration methods, Errors and compensation, Instrument transformers, Digital voltmeters and multimeters, phase, Time and frequency measurement; phantom loading; Oscilloscopes, Error analysis. Potentiometer and Instrument Transformer: DC and AC potentiometer, C.T. and V.T. construction, theory, operation, characteristics; Energy Meter; Digital Instrumentation. <u>Electronics and Communication Engineering:</u> Introduction to Communication systems; Fourier Series and Transforms. Hibert Transforms. Band pass Signal and System Representation. Random Processes, Stationarity, Power Spectral Density, Gaussian Process. Noise. Signal Distortion over a communication channel: Signal Power and Power Spectral Density. Modulation and detection in analogue systems: Amplitude Modulation;	40	120

Part	Section	Subject	No. of Questions	Maximum Marks
		Super heterodyne AM receive; Angle Modulation; FM receiver. Pulse Code Modulation; Sampling and data reconstructions; Quantization& coding: Sampling Theorem; Differential Pulse Code Modulation; Delta Modulation Time division and frequency division multiplexing; Equalization; Introduction to Satellite Communication; Cellular Communication; Optical Fiber communication, Basic information theory. Power Electronics: Introduction of semiconductor power devices: Diode, Thyristor, Triac, GTO, MOSFET, IGBT Characteristics, operation, principles and ratings, Snubbed designs, selection and protection, Firing circuits. AC-DC converters; uncontrolled, semii-controlled, fully controlled and dual converters in single-phase and three-phase configuration. Improved power quality AC-DC converters. Choppers: Introduction to dc-dc conversion, various topologies, buck, boost, buck-boost converters. Inverters: Basics of dc to ac conversion, inverter circuit configuration and principle of operation, VSI and CSI, single and three-phase configurations, square wave and sinusoidal PWM control methods and harmonic control. Design problems. AC voltage controllers; Introduction to ac to ac conversion, single phase and three-phase ac voltage controller circuit configurations, applications. Basics of cyclo-converters. Microprocessor systems and computers System: Basics of Microprocessor system, Architecture of 8085 microprocessor, instruction set. Programming using assembly language (8085) for		

Part	Section	Subject	No. of Questions	Maximum Marks
		looping, decision making, counting, indexing, searching. Interrupts and subroutine. Timing, interfacing memory, input/output and other peripherals e.g., 8255, 8253/54, 8259 and 8257, data (A/D and D/A) converters. Introduction to 8086/88 processors and 8051 microcontrollers. Control Systems: Mathematical modeling and representation of systems, Feedback principle, transfer function. Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots, Root lici, Stability analysis, Lag, Lead and Lead-Lag compensators', PI and PID Controllers: state space model, State transition matrix.		