सहायक अभियंता (यांत्रिकी), महाराष्ट्र अभियांत्रिकी सेवा, गट - ब
जलसंपदा विभाग

परीक्षेचे टप्पे:- लेखी परीक्षा - ४०० गुण, **मुलाखत**-५० गुण , **प्रश्नपत्रिकांची संख्या:-** दोन

पेपर क्र.	विषय	संकेतांक	प्रश्नसंख्या	गुण	माध्यम	कालावधी	दर्जा	प्रश्नपत्रिकेचे स्वरुप
१	मराठी	०१४	१००	१००	मराठी	एक तास	१२ वी	वस्तुनिष्ठ बहुपर्यायी
	इंग्रजी				इंग्रजी		पदवी	
	सामान्य अध्ययन				मराठी व इंग्रजी			
२	यंत्र अभियांत्रिकी	९६४	१५०	३००	इंग्रजी	अडीच तास	बी.ई. (यांत्रिकी)	वस्तुनिष्ठ बहुपर्यायी

-: अभ्यासक्रम :-

क्रमांक	घटक व उपघटक
1	*मराठी :-*
	सर्व सामान्य शब्दसमूह, वाक्यरचना, व्याकरण, म्हणी व वाक्प्रचार यांचा अर्थ व उपयोग तसेच उताऱ्यावरील प्रश्नांची उत्तरे
2	*इंग्रजी :-*
	Common Vocabulary, Sentence structure, Grammar, Use of Idioms and phrases & their meaning and comprehension of passage.
3	*सामान्य अध्ययन :*
अ	**विज्ञान व अभियांत्रिकी**
१	वैज्ञानिक विचारसरणी व दृष्टीकोन - विज्ञानाचे स्वरुप, विज्ञानाची पूर्वगृहितके, शास्त्रीय पध्दती, वैज्ञानिक ज्ञान
२	आधुनिकीकरण व विज्ञान - आधुनिकीकरण म्हणजे काय, आधुनिकीकरणाचे प्रकार, आधुनिकीकरण व भारत (समस्या व उपाय)
३	जागतिक तसेच भारतातील वैज्ञानिक व अभियांत्रिकी प्रगती.
४	वैज्ञानिक प्रगतीमुळे शहरी तसेच ग्रामीण जीवनावर झालेला परिणाम.
५	भारतीय समस्यांवर वैज्ञानिक उपाय, उदा. ऊर्जा समस्या, अन्नधान्य समस्या, लोकसंख्या समस्या, पर्यावरण समस्या, शैक्षणिक समस्या, गृहनिर्माण समस्या, परिवहन समस्या, संपर्क विषयक समस्या, लोकस्वास्थ्य, इत्यादी.
ब	**जागतिक तसेच भारतातील चालू घडामोडी :-**
	राजकीय, औद्योगिक,आर्थिक, सामाजिक, शैक्षणिक, भौगोलिक, खगोलशास्त्रीय, सांस्कृतिक.

4		*MECHANICAL ENGINEERING*
	1	**APPLIED THERMODYNAMICS:**
		Thermodynamic Concepts, First Law of Thermodynamics, One dimensional Flow of Compressible Fluid, Second Law of Thermodynamics, Availability, Properties of Steam.
	2	**STRENGTH OF MATERIALS:**
		Simple Stress and Strain, S. F. and B. M. in Beams, Simple Theory of Bending, Shear Stress in Beams, Simple Theory of Torsion, Bending moment combined with Torsion and Axial Loads, Principal Stresses, Deflection of Beams, Strain Energy, Theories of failure.
	3	**MATERIAL SCIENCE:**
		Strain Hardening, Constitution of Alloys, Iron-Carbon Equilibrium Diagram, Heat-Treatment of Steels, Cast Irons, Introduction to International Standards/Codes, Non-Ferrous Metals and Alloys, Fatigue Failure, Creep, Alloy Steels, Strengthening mechanism, Powder Metallurgy.
	4	**HEAT TRANSFER:**
		Conduction, convection & radiation, emissivity, heat exchangers, mass transfer (mechanism, fick's law of diffusion, isothermal evaporation of water into air, convective mass transfer)
	5	**MACHINE DESIGN & VIBRATION**:
		Design consideration in castings &forgings, theories of failure, Design for static loadings, Design against fluctuating loads, Design of shafts, Design of springs, Design of belts. Free un-damped single degree of freedom vibration system, Free damped single degree of freedom vibration system, Free un-damped multi degree of freedom vibration system, forced single degree of freedom vibration system, vibration measuring system, rotor dynamics, balancing.
	6	**MECHATRONICS:**
		Introduction to mechatronics, overview of microprocessors (8085), hydraulic & pneumatic system in automation, PLC in automation, transient response, root locus concepts.
	7	**THEORY OF MACHINES**:
		Basic Kinematics, Special Mechanisms, Velocity Analysis of mechanisms, Acceleration analysis of Mechanism, Static and dynamic force analysis, Flexible connector mechanisms, Spur gear mechanism, Gear Trains, Cam Mechanism ,clutches, brakes dynamometer, gear trains, cam & follower.
	8	**DYNAMICS OF MACHINERY:**
		Governors, Gyroscope, (Static and dynamic balancing of single rotor & multi rotor system.
	9	**BALANCING OF RECIPROCATING MASSES:**
		In-line engines, Radial Engines, V-Engines.) VIBRATIONS (Classification of Vibrations), Free Un-damped Multi degree of freedom vibratory systems, Forced single degree of freedom vibratory system
	10	**INTERNAL COMBUSTION ENGINES:**
		Classification of I.C. Engines, Cycle Analysis of I.C. Engines, S.I. Engines, C.I. Engines, Supercharging/Turbo charging, Performance Characteristics of S.I. & C.I. Engines, Air Pollution due to I.C. Engines, Fuels of I.C. Engines, Engine Lubrication, Engine Cooling, Introduction to CNG, LPG, Stratified Charge and Wankel engines. Recent Developments in I.C. Engines.
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11	**PRODUCTION PROCESS:**	
	Metal Casting Process, Forming Processes, Welding and Joining Processes, Powder Metallurgy, Moulding with polymers, Non Destructive Techniques, CNC machines, Metal Cutting & Tool Engineering, Surface Finish, Cutting Tool Materials, Coolants, Design of Cutting Tools or Tool design	
12	**FLUID MECHANICS:**	
	Fluid Kinematics, Fluid Dynamics, Real fluid flows, Boundary Layer Flows Compressible Fluid flow., Hydraulic Machinery (Turbines, Pumps, compressors).	
13	**MEASUREMENT & METROLOGY:**	
	Static characteristics, Displacement measurement, strain measurement, measurement of angular velocity, pressure measurement, temperature measurement, vacuum measurement, acceleration measurement, metrology.	
14	**CAD/CAM/CIM:**	
	Introduction & Elements Of Interactive Computer Graphics, Techniques For Geometric Modeling, transformation, manipulation & data storage, NC & CNC Technology, Group Technology, CAPP, and CAQC, Computer Integrated Manufacturing & Technology Driven Practices.	
15	**REFRIGERATION AND AIR CONDITIONING**:	
	Introduction to Refrigeration Carnot refrigerator, Carnot heat pump, Co-efficient of Performance, unit of refrigeration. Aircraft Air refrigeration systems, Vapor Compression Refrigeration System, Vapor Absorption Refrigeration, Psychrometry, Air-Conditioning, Duct Design.	
16	**MANUFACTURING PLANNING AND CONTROL**:	
	Manufacturing Planning and control System, Forecasting, Planning Function, Planning for Material requirements, Scheduling & Sequencing, Project management, Advanced concepts in production planning .	
17	**FINITE ELEMENT ANALYSIS**:	
	Introductory Concepts: Introduction to FEM. Brief History. General FEM procedure. Applications of FEM in various fields. Advantages and disadvantages of FEM Differential Equations in different Approximate solution of differential equations in fields, Matrix Algebra, FEM Procedure, Minimization of a functional. Principle of minimum total potential. Piecewise Rayleigh-Ritz method Example problems in one-D Isoperimetric. Algorithms for solution of equations dimensional structural analysis, Two dimensional finite element formulations, Finite element formulation of dynamics.	
18	**INDUSTRIAL ENGINEERING AND ENTERPRISE RESOURCE PLANNING**:	
	Work Study & Ergonomics, Method Study, Work Measurement, Value Engineering, resource utilization (Inventory Management, Statistical Quality Control), Enterprise Resource Planning, ERP-Implementation methodologies, Success and failure cases, ERP Audit, Future.	

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