



ગુજરાત જાહેર સેવા આયોગ

છ-૩ સર્કલ પાસે, છ રોડ, સેક્ટર-૧૦/એ, ગાંધીનગર-૩૮૨૦૧૦

જાહેરાત ક્રમાંક: ૮૭/૨૦૨૦-૨૧

જગ્યાનું નામ: મદદનીશ ઈજનેર(મીકેનીકલ), વર્ગ-૨(GMC)

ભાગ-૧ અને ભાગ-૨ ના ૧૮૦ મિનિટના સંયુક્ત પ્રશ્નપત્રની પ્રાથમિક કસોટીનો અભ્યાસક્રમ

| ભાગ-૧ પ્રાથમિક કસોટીનો સામાન્ય અભ્યાસક્રમ | | |
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| માધ્યમ : ગુજરાતી | કુલ પ્રશ્નો : ૧૦૦ | કુલ ગુણ : ૧૦૦ |
| ૧ | ભારતની ભૂગોળ - ભૌગોલિક, આર્થિક, સામાજિક, કુદરતી સંસાધન અને વસ્તી અંગેની બાબતો - ગુજરાતના ખાસ સંદર્ભ સાથે | |
| ૨ | ભારતનો સાંસ્કૃતિક વારસો - સાહિત્ય, કલા, ધર્મ અને સ્થાપત્યો- ગુજરાતના ખાસ સંદર્ભ સાથે | |
| ૩ | ભારતનો ઇતિહાસ - ગુજરાતના ખાસ સંદર્ભ સાથે | |
| ૪ | ભારતની અર્થવ્યવસ્થા અને આયોજન | |
| ૫ | <u>ભારતીય રાજનીતિ અને ભારતનું બંધારણ :</u> (૧) આમુખ (૨) મૂળભૂત અધિકારો અને ફરજો (૩) રાજ્યનીતિના માર્ગદર્શક સિદ્ધાંતો (૪) સંસદની રચના (૫) રાષ્ટ્રપતિની સત્તા (૬) રાજપાલની સત્તા (૭) ન્યાયતંત્ર (૮) અનુસૂચિત જાતિ, અનુસૂચિત જનજાતિ અને સમાજના પછાત વર્ગો માટેની જોગવાઈઓ (૯) એટર્ની જનરલ (૧૦) નીતિ આયોગ (૧૧) પંચાયતી રાજ (૧૨) નાણાં પંચ (૧૩) બંધારણીય તથા વૈધાનિક સંસ્થાઓ- .ભારતનું ચૂંટણી પંચ, સંઘ લોક સેવા આયોગ, રાજ્ય લોક સેવા આયોગ, કોમ્પ્યુટર એન્ડ ઓડિટર જનરલ; કેન્દ્રીય સતર્કતા આયોગ, લોકપાલ તથા લોકાયુક્ત અને કેન્દ્રીય માહિતી આયોગ | |
| ૬ | સામાન્ય બૌદ્ધિક ક્ષમતા કસોટી | |
| ૭ | સામાન્ય વિજ્ઞાન, પર્યાવરણ અને ઇન્ફર્મેશન એન્ડ કોમ્યુનિકેશન ટેકનોલોજી | |
| ૮ | ખેલ જગત સહિત રોજબરોજના પ્રાદેશિક, રાષ્ટ્રીય અને આંતરરાષ્ટ્રીય મહત્વના બનાવો | |

Part-1 Syllabus of Preliminary Test

Advt. No.87/2020-21

Post: Assistant Engineer (Mechanical), Class-II, (GMC)

Medium: Gujarati

Questions – 100

Total Marks- 100

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|---|---|
| 1 | Geography of India-Physical, Economic, Social, Natural Resources and population related topics- with special reference to Gujarat |
| 2 | Cultural heritage of India-Literature, Art, Religion and Architecture- with special reference to Gujarat |
| 3 | History of India with special reference to Gujarat |
| 4 | Indian Economy and Planning |
| 5 | <u>Indian Polity and the Constitution of India:</u> 1. Preamble 2. Fundamental Rights and Fundamental Duties 3. Directive Principles of State Policy 4. Composition of Parliament 5. Powers of the President of India 6. Powers of Governor 7. Judiciary 8. Provisions for Scheduled Castes, Scheduled Tribes and backward classes of the society 9. Attorney General 10. NITI Aayog 11. Panchayati Raj Institutions 12. Finance Commission 13. Constitutional and Statutory Bodies: Election Commission of India, Union Public Service Commission, State Public Service Commission, Comptroller and Auditor General; Central Vigilance Commission, Lokpal and Lokayukta, Central Information Commission |
| 6 | General Mental Ability |
| 7 | General Science, Environment and Information & Communication Technology |
| 8 | Daily events of Regional, National and International Importance including Sports |

Part-2 Syllabus of Concerned Subject for Preliminary Test

Advt. No.87/2020-21

Post: Assistant Engineer (Mechanical), Class-II, (GMC)

Marks – 200

Questions – 200

Medium - English

1. MECHANICS OF SOLIDS:

- Stress-strain relations, uniaxial loading, stress/strain tensor applied to a body subject to loads, thermal stress. Beams: bending moment and shear force diagram, bending stresses and deflection of beams, shear stress distribution.
- Design of solid and hollow circular shaft subjected to torque and combined loading for rigidity and stiffness; Design of Keys and splines.
- Helical springs, combined stresses, Design of fly wheels, leaf springs, thick and thin walled pressure vessels, strain energy concepts and theories of failure.

2. ENGINEERING MATERIALS:

Basic concepts of structure of solids, Crystalline materials, Defects in Crystalline material, Alloys and binary phases diagrams, structural properties of common engineering materials, Heat treatment of steel, plastics, ceramics composite materials, common applications of various materials.

3. THEORY OF MACHINES:

- Simple mechanism, kinematics and their classifications, link mechanism.
- Inversion: Four bar chain mechanism, Flexible power transmission system, Geometrical configuration.
- Gyroscope, cam profile, sound and vibrations of mechanical system.
- Balancing: Dynamic balancing, rotor balancing, etc. Balancing of single and multi-cylinder engines, linear vibration analysis of mechanical systems, Spring-Mass-Dashpot system subject to axial load, Electrical analogy (single degree and two degrees of freedom). Automatic Controls, Analysis and design of sliding and rolling contact (anti-friction) bearings, Hydrodynamic bearings.

4. MANUFACTURING PROCESSES:

Conventional manufacturing processes like Turning, Welding, Shaping, Molding, Foundry Technology, Drilling etc. Merchant force analysis, Taylor's tool life equation, machine ability and machine economics, rigid small and flexible automation, NC, CNC. Recent machining methods - EDM, ECM and ultrasonic. Application of lasers and plasmas, analysis of forming processes. High energy rate forming jigs, fixtures, tools and gauges. Inspection of length, position, profile and surface finish, computer aided manufacturing.

5. THERMODYNAMICS:

Basic concepts, open and closed systems, Application of thermodynamic laws, gas equations. Laws of Thermodynamics, First law, Second law, Zeroth law Statement and Explanation. Gas Law: Boyle's law, Charles' law, Perfect gas equation, Thermodynamic cycles: Rankine cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle, etc.

6. IC ENGINES, FUELS AND COMBUSTION:

Spark Ignition and compression ignition engines. Four stroke and two stroke engines. Mechanical, thermal and volumetric efficiency. Heat balance, Combustion process in SI and CI engine, Pre ignition, detonation in SI engines. Diesel knock in CI engines. Choice of engine fuels octane and Cetane rating. Alternate fuels, carburetion and fuel injection. Engine emission and control. Solid, liquid and gaseous fuels, stoichiometric air requirement and excess air factor, fuel gas analysis, higher and lower calorific values and their measurements.

7. DESIGN OF TRANSMISSION SYSTEMS:

- Flexible transmission elements- design of flat belts & pulleys, design of chains and sprockets.
- Gear transmission- speed ratios and number of teeth, force analysis, tooth stresses, dynamic effects, fatigue strength, factor safety, gear materials; Design of straight tooth spur gear and parallel axis helical gears based on strength and wear considerations. Straight bevel gear- tooth terminology, tooth forces and stresses, equivalent number of teeth.
- Worm gear, merits & demerits, terminology, thermal capacity, materials, forces & stresses, efficiency, estimating the size of worm gear pair.
- Gear box - geometric progression, standard step ratio; Ray diagram, kinematics layout; Design of sliding mesh gear box- Design of multi-speed gear box for machine tool applications; constant mesh gear box, speed reducer unit; Variable speed gear box; Fluid couplings, Torque converters for automotive applications.
- Design of plate clutches, axial clutches, cone clutches, internal expanding rim clutches;
- Electromagnetic clutches; Band and Block brakes, external shoe brakes, internal expanding shoe brake.

8. HEAT TRANSFER, REFRIGERATION AND AIR CONDITIONING:

One and two dimensional heat conduction, Heat transfer from extended surfaces, heat transfer by forced and free convection Heat exchangers. Fundamentals of

diffusive and connective mass transfer. Radiation laws, heat exchange between black and non-black surfaces, Network analysis, Heat pump refrigeration cycles and systems, condensers, evaporators and expansion devices and controls. Properties and choice of refrigerant. Cooling load calculation, solar refrigeration.

9. AUTOMOBILE ENGINEERING:

Anatomy of vehicles, Automobile Systems - Necessity of clutch, Types of clutch, Constructional and functional details of clutch, Necessity of Transmission, Types of Transmission system, Brake and suspension systems, control systems, conventional steering and power steering, Electrical systems- for starting, ignition and lighting, repairs and maintenance of automobiles.

10. COMPUTER AIDED DESIGN AND COMPUTER AIDED MANUFACTURING (CAD/CAM):

CAD work station, Graphic packages-types and features, Geometric modeling, Various CAD softwares, Introduction to CNC machines- constructional features and working. Automatic tool changer (ATC) and Automatic pallet changer (APC). CNC Part Programming.

11. POLLUTION AND VEHICLE INSURANCE

Exhaust gasses emission control systems. CNG conversion, Vehicle noise and its control. National and International standard norms for exhaust gas pollution control. PUC Certification. Licensing, Regulations of motor vehicles, Motor vehicle insurance.

12. DIAGNOSIS AND TESTING OF VEHICLE:

Testing of various elements of the vehicle systems-Battery, clutch, brakes, wheels and tyres (wheel alignment, wheel balancing), etc. Performance test.

13. ENVIRONMENTAL SCIENCE

Ecosystem, Air and Noise pollution, Water and Soil pollution, Renewable sources of Energy, Solid waste management, ISO 14000 & Environmental Management

14. ELECTRIC AND HYBRID VEHICLES

Electric vehicles, Hybrid vehicles, Electric Propulsion System, Energy Storage Devices, Fuel Cell and Solar Powered Vehicles

15. Role of AI (Artificial Intelligence) and Machine Learning (ML) in Automotive Industry, Predictive Vehicle Technology and Future of Automobiles (Self Driving Technology), Cruise control for the Driverless Cars, Collision Avoidance Technology (CA System)

16. CURRENT TRENDS AND RECENT ADVANCEMENTS IN THE RELEVANT FIELD.