ANDHRA PRADESH POWER GENERATION CORPORATION LTD.
(A Govt. of AP Undertaking)
Vidyut Soudha, Vijayawada-520 004.

Memo.No.CGM(Adm,IS&ERP)/GM(HR-ADM)/EE(Adm)/Dy.EE(Adm-II)/AEE-I/D.No.428/22,Dt:20.10.2022.

Sub: Estt-APGENCO– E.S.– Filling up of the post of Junior Engineer by way of Appointment by transfer–Syllabus Intimation-Reg.

Ref: 1) Circular Memo.No.CGM(Adm,IS&ERP)/DS(Adm)/EE(Adm)/Dy.EE(Adm-II)/AEE (A-I)/D.No.189/22, Dt: 11.05.2022.
2) Circular Memo.No.CGM (Adm,IS&ERP)/DS(Adm)/EE(Adm)/Dy.EE(Adm-II)/AEE (A-I)/D.No.349/22,Dt:01.09.2022.

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All the Station Heads/Functional Heads are requested to inform the syllabus for written test to the in-service employees working in Accounts, P&G, O&M services etc. who have applied for the post of Junior Engineer by way of Appointment by transfer and place in the local notice boards.

Encl: Syllabus (Elecl/Mechl/ECE).

BODDU SREEDHAR
Chief General Manager (Adm, IS&ERP)

To
All Chief Engineers /APGENCO.
All Superintending Engineers /APGENCO.
All in-Charges of Generating Stations /APGENCO.
All Chief General Managers/APGENCO.
APGENCO Website.
Stock File/Spare.

//FORWARDED BY ORDER//

Deputy Executive Engineer(Adm-II)

SECTION – A

(Syllabus for Sub-Engineer/Electrical)

1. Elements of Electrical Engineering:

   a. Comprehend basic principles of electricity
   b. Know the magnetic effects of electric current.
   c. Understand electromagnetic induction
   d. Understand electric charge and electrostatic field

2. Electrical circuits:

   a. Understand Kirchoff's laws and star delta Transformations and Network Theorems.
   b. Comprehend the relationship between quantities connected with alternating current.
   c. Comprehend the single phase A.C. Circuits
   d. Poly Phase Circuits.

3. D.C.Machines:

   a. Fundamentals of D.C. Generators
   b. Armature Reaction and Characteristics of D.C. Generator
   c. Fundamentals of D.C. Motors
   d. Speed Control and Starters of D.C.Motors
   e. Characteristics and Testing of D.C.Motors

4. Electrical Measuring Instruments & Batteries:

   a. Know the Classification of different measuring instruments.
   b. Understand the construction and working of different electrical measuring instruments
   c. Understand the method of measurement of resistance.
   d. Transducers and sensors
   e. Understand Batteries

5. A.C.Machines:

   a. Understand the working of Single Phase Transformers
   b. To understand Three Phase Transformers.
   c. Know the classification, construction, working and testing of alternators
   d. Comprehend the procedure for voltage control and synchronization.
   e. Comprehend the working of synchronous motors
   f. Comprehend the working of three phase induction motor
   g. Comprehend the working of single phase induction motor
   h. Comprehend the working of single phase commutator motor

6. Power Systems:

   a. understand the various sources of Power Generation
   b. understand working of Thermal Power station
   c. understand hydroelectric power station
   d. understand the working of Nuclear & Gas Power stations
   e. Comprehend combined operation and economics of power stations.
   f. Comprehend the need for transmission and choice of supply system
   g. Line structure for transmission and distribution
   h. Underground cables.
   i. Understand different types of switchgear, fuses and reactors and their working
   j. Protective relays
   k. Protection of alternators, transformer and transmission line.
   l. Lighting arrestors and neutral grouding

7. Electronics:

a. passive components (Resistors, Capacitors and Inductors)
b. Know the semi-conductor Devices.
c. Understand the working principle of Power supply circuits
d. Understand the performance of special devices.
e. Understand the principle of working of Amplifiers.
f. Understand the principle of working of Small Signal Amplifiers.
g. Understand the principle of Oscillators
h. Appreciate the need for Modulation and Demodulation
i. Electronic instruments and industrial applications
j. Know the basics of ICs
k. Know the basics of digital electronics
l. Understand the working of combination logic circuits
m. Understand the working of sequential logic circuits
n. Understand working of registers and memories

8. Electrical Utilization and traction:

a. understand the principles of lightings
b. understand principle of electric heating, welding and its industrial application
c. electric traction systems

9. General Mechanical Engineering:

a. I.C. Engines – Boilers – Turbines
b. Understand the working of the centrifugal pumps

10. Information Technology:

a. understand the features of MS-word
b. understand working of MS-Excel
c. Understand MS-Power Point
d. Understand working with MS-Access

11. Industrial Management and Entrepreneurship:

a. understand the principles of management as applied to industry
b. Know the organization structure of an industry and the behavior of an individual in an organization.
c. Understand the different aspects of production management
d. Understand the role of material management industries.
e. Understand marketing, sales and feasibility study.
f. Comprehend the provisions of industrial legislation in India and safety procedures.
g. Understand ISO 9000 and TQM
h. Understand the role of entrepreneur in economic development and in improving the quality of life.

SECTION – A

(Syllabus for Sub-Engineer/Mechanical)

1. Electrical Engineering & Basic Electronics:

   a. comprehend basic Electrical Fundamentals
   b. Understand D.C.Machines
   c. Understand A.C. Fundamentals and A.C. Machines
   d. Understand storage batteries
   e. Understand the principles of semi-conductor devices
   f. Understand electrical measuring instruments and safety procedures

2. Thermal Engineering –I:

   a. understand the Fundamentals and Laws of Thermodynamics
   b. understand the laws of perfect gases
   c. understand Thermodynamic Processes on gases
   d. know the fuels and Combustion
   e. appreciate the study of air standard cycles
   f. Comprehend the construction, working and performance of Internal Combustion engines.

3. Thermal Engineering – II:

   a. understand the Properties of Stream
   b. understand the working of steam boilers
   c. steam Nozzles and Turbines
   d. comprehend the construction and working of Air Compressors
   e. Understand the working and applications of gas turbines and Jet Propulsion.
   f. To appreciate the measuring devices used in instrumentation.

4. Hydraulics & Hydraulic Machinery:

   A. Hydraulics:
      a. understand the various properties of Fluids
      b. understand the behaviour of liquids in motion
      c. evaluate frictional losses during flow of liquids through pipe

   B. Hydraulic Machines:
      a. analyze forces during the impact of jets
      b. understand the working of water turbines
      c. know the working of pumps.

5. Energy Sources and power plant Engineering:

   a. Introduction of Renewable Energy Sources
   b. solar and wind energy
   c. fuel cells and MHD Generator
   d. Bio and Tidal Energy
   e. Analyse the elements of Thermal and Nuclear Power Plants
   f. To understand the impact of pollutants on Environment

6. Industrial Management & Entrepreneurship:

   a. understand the principles of management as applied to industry
   b. Know the organization structure of an industry and the behavior of an individual in an organization.
   c. Understand the different aspects of production management
   d. Understand the role of material management industries.
   e. Understand marketing, sales and feasibility study.
   f. Comprehend the provisions of industrial legislation in India and safety procedures.
   g. Understand ISO 9000 and TQM
   h. Understand the role of entrepreneur in economic development and in improving the quality of life.

7. Estimating and Costing:

   a. List out the elements of costing
   b. Understand the fundamentals of estimation
   c. Estimate the weight of material required for a product and machining times
   d. Estimate the fabrication cost
   e. Estimate the forging cost
   f. Estimate foundry cost

8. Manufacturing Technology –I:

a. Lathe & Lathe Work
b. Illustrate the working of Shaper, Slotter, Planner and Broaching Machine
c. Cutting Fluids, Coolants & Lubricants
d. Metrology
e. Understand the different welding methods and technique

9. Manufacturing Technology –II:

a. milling and Gear Making
b. grinding and finishing processes
c. modern machining processes
d. plastic processing
e. press Tools, Jigs and Fixtures
f. Jig Boring

10. Refrigeration and Air Conditioning:

a. understand the various methods of Refrigeration
b. Understand vapour compression and Vapour absorption in Refrigeration systems
c. Know the refrigerants, refrigeration Equipment and applications of Refrigeration
d. Understand fundamentals of A/C and A/C equipment
e. Understand psychometry, cooling and heating loads.
f. Appreciate the applications of A/C servicing and maintenance of refrigeration and A/C equipment

11. Information Technology:

a. understand the features of MS-word
c. understand working of MS-Excel
d. Understand MS-Power Point
e. Understand working with MS-Access

SECTION – A

(Syllabus for Sub-Engineer/Electronics)

1. **Electronic Components and Devices:**

Inductors, Transformers, switches, connectors and relays. PN Junction Diode, BJT configurations, JFET and MOSFETs – Rectifiers and Regulators.

2. **Elements of Combinational and sequential logic circuits:**

Flip-flops, counters, registers, memories, A/D and D/A converters.

3. **Fundamentals of Instrumentation and Transducers:**

Accuracy, precision, errors, LVDT, RVDT, Synchros, RTD, Thermistors, Thermocouples pressure and flow measurement.

4. **Basics of DC machines, AC machines and transformers**

5. **Measuring instrumentation:**

Analog Instruments – bridges – DVMS – Q-meter – logic analyzer – signal and function generators.

6. **Process instrumentation:**

pH and conductivity measurement – viscosity and density measurements – spectrophotometers – gas analyzer – auto analyzer – chromatographs.

7. **Power plant instrumentation and unit operation:**

Introduction power plant: Unit operation and Unit processes, material balance and energy balance. Introduction to thermal power plant, significance of instrumentation in power plant, principle and working and salient features of hydro electric, nuclear gas turbine plant.

Processes in Thermal Power plant: evaporation: distillation: leaching and extraction: gas absorption: humidification and dehumidification adsorption: drying: size reduction: crystallization: mixers.

Boiler instrumentation and control: measurements and control loops, drum level control, fuel flow control, furnace draft and excess air control, combustion control, steam pressure control, boiler safety interlocks.

Turbine monitoring and control: turbine – supervisory system for monitoring of mechanical parameters – speed, vibration, eccentricity, axial shift, shell temperature monitoring, lube oil temperature control, turbine trip condition.

Instrumentation and control of alternator, steam heaters, pumps and compressors, condenser.

Auxiliaries in power plants: soot blowers, electrostatic precipitator, oil automation system, water treatment plant, cooling towers.

8. **Power Electronics:**

SCR, Triac, UJT, Single and three phase converters – inverters – cycloconverters, SMPS and UPS.

SECTION - B

(Syllabus on power plant related topics for Sub-Engineers (except Sub-Engineer/Civil))

A. Thermal Power Stations - Process

1.	Boiler	a. Boiler construction b. Pressure Parts c. Fans – types d. Mills – types e. Air Preheaters f. Fuels – Supply Systems g. Firing and Arrangements in power House h. ESP – Construction – Operation – Details i. Safety Valves and their importance
2.	Turbine	a. Turbines – Parts – Details b. CWPs, Cooling Towers, Condenser Cooling and Vacuum System – Details c. LP Heaters, DA, CEPs and Condensate system d. BFPs, HP heaters and feed water system e. PRDS, HFO and Light oil systems
3.	Generator	a. Electrical Power – Energy – Voltage – Current – Explanation. b. Turbo – Generator construction – details c. Excitation systems d. Transformers – working – cooling systems – types
4.	Protection	Protection of Generators, Generator Transformers etc., circuit breakers.
5.	Economic aspects	Generation Costs and their classification, PLF, Plant base load and Peak load operation and optimul operation of thermal and Hydel stations.
6.	switch-yard	Switch – yard – Equipment – Details
7.	Electrical circuits:	Storage batteries, classification of cells, construction chemical action of cells, lead acid, NI – Cadmium Cells, VRLA batteries (maintenance free batteries) concept of trickle charging and boost charging.
8.	Electrical measuring instruments:	a. measurement of voltage current, power, energy etc. b. principles of measurement of pressure, flow, level, diff pressure, temperature (thermocouple, RTD) etc. c. Principle of measurement of PH, conductivity, oxygen using Zircona principle.
9.	AHP	Ash handling plant – Equipment – Functions
10.	CHP	Coal handling plant – Equipment – Functions
11.	WTP	Water treatment plant – Flow Charts/Diagrams

B. Hydel Power Stations – Process

1. Functions of various Equipment of Hydel Power Stations
2. Layout of equipment In Hydel Power Stations
3. Symbols of various tools and Tackles, Fasteners and their functions.
4. General knowledge about various works, abbreviations pertaining to Hydel power stations.

5. Various Equipment of Hydel Power Stations.

6. Types of turbines

7. Penstock.

8. Surge Tank.

9. Turbine

10. Governing system

11. Trash rack

12. Generator – Construction details – Function.

13. Electrical Energy, Power, Voltage, Current – Definition.

14. Transformers – Details and Functions.

15. Switch-yard - Important Equipment - Functions

16. Electrical circuits: Storage batteries, classification of cells, construction chemical action of cells, lead acid, NI – Cadmium Cells, VRLA batteries (maintenance free batteries) concept of trickle charging and boost charging.

17. Electrical measuring instruments:

a. measurement of voltage current, power, energy etc.

b. principles of measurement of pressure, flow, level, diff pressure, temperature (thermocouple, RTD) etc.

C.

1. Industrial Electronics

To understand PLC and programming – logic with relays, PLC ladder logic, timers, counters, input output modules, digital, analog I/O s.logic functions – OR, AND, EX-OR etc.

2. BASIC communication Engineering

a. Understanding the work of power line carrier communication (PLCC) technique

b. Understanding the principle of working of EPABX

3. Understand the distributed control system DCS.

D.

1. FPS - Fire protection Systems – Types – Functions

2. Fire accidents - Fire accidents and preventive measures

3. Safety aspects - Safety of personnel and equipment – Safety measures and precautions.

4. House keeping - House keeping and its importance.