सी एस आई आर - केन्द्रीय यांत्रिक अभियांत्रिकी अनुसंधान संस्थान
CSIR-CENTRAL MECHANICAL ENGINEERING RESEARCH INSTITUTE
वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद् / Council of Scientific & Industrial Research
दुर्गापुर / **Durgapur - 713 209**

संख्या/**No.8/2/2018(1)-Rct.**   दिनांक/ **Dated: 21.10.2022**

सूचना/Notice

Sub: Recruitment of Technical Officer (Group III) under CSIR-CMERI Advt. No. 05/2018-reg.
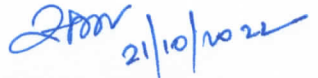
In continuation of this Institute's Notice of even no. dated 20.05.2021, this is for information of all concerned that the applicants, found provisionally eligible will have to appear for a Trade Test in their respective discipline(s). Those who will qualify the trade test will be shortlisted for the Written Competitive Examination. The final merit list will be drawn as per the performance of the candidates in the Competitive Written Examination.

1. The Syllabus for Trade Test for the respective trades are attached herewith as Annexure-A. Schedule and Venue of the Trade Test for each of the disciplines and further instructions to the candidates in this regard will be notified shortly.

2. The Scheme and Syllabus for Competitive Written Examination are also attached herewith as Annexure-B.

3. All further information regarding this recruitment drive will be notified only on the Institute official website i.e. www.cmeri.res.in. As such, the candidates are advised to visit the site regularly.

Enclo: As stated above

एस. मज़ूमदार /S. Majumdar
प्रशासनिक अधिकारी /Administrative Officer

Copy to:

1. All Notice Boards
2. Head IT: For publication of the notice in the Institute website
3. Office Copy

Syllabus for Trade Test for the recruitment of Technical Officer (Group III) against CSIR-CMERI Advt. No. 05/2018

(A)   Mechanical / Manufacturing / Production

CNC Machining - CNC Part programming (Manual part programming and Programming using software from 2D/3D models), Job and Tool setting for CNC Turning as well as Multi-axis Machining Centre, Tool path generation using CAM software. Proficiency in using CAD software - 2D/3D modelling. Maintenance of CNC and Tool Room Machines

Taper turning using tailstock offset method and taper turning attachment. Eccentric external turning using a four jaw chuck. External thread cutting using a single point cutting tool. Cutting teeth of spur gears using form milling cutter in a universal milling machine.

Working knowledge of CNC Die-sinking EDM and Wire-cut EDM.

Metrology of a metric screw thread, Metrology of a spur gear.

Edge/Joint preparation in welding and joining using shielded metal arc welding. Hands-on practice on metal inert gas welding (MIG) and tungsten inert gas welding (TIG) or gas tungsten arc welding.

Pattern and Mould making and working knowledge in Foundry practices (sand casting and die casting).

(B)   Electrical Engineering

Measurement with various instruments: PMMC & MI meter (Ammeter, Voltmeter), Multimeter (Digital/Analog), Wattmeter, P.F. meter, Energy meter (Digital/analog) Insulation Tester (Megger), Earth tester. Frequency meter, Phase Sequence meter, Tong tester, Tachometer, Digital Oscilloscope.

Electric Machines: Single and three phase transformers: winding, characterization, voltage regulations, power factor, testing like open circuit, short circuit testing, load testing, transformer oil testing.

Electric rotating machines: characteristics curves of dc, induction, synchronous type motors and generators: magnetization characteristics, no load and block rotor test, brake test, heat run test etc.

Network Analysis: Superposition and reciprocity theorems, Maximum power transfer theorem, power in three phase circuits, frequency and power factor, three phases balanced and unbalanced circuits, star and delta networks circuits

Power Systems: Characteristics of the microprocessor based DMT/IDMT over current relay, symmetrical fault analysis in ac network, study of string efficiency across the insulators, layout of control cabinet & control panel, study & understanding layout drawing of control cabinet, panel, power & control circuits.

Testing and connection of control elements: Isolator, pushbutton switches, indicating lamps, MCB, fuse, contactors, relays, overload relay, timers, rectifier, limit switches, control transformers.

(C)   Civil Engineering

a) Lab Testing of construction materials:

Concrete : Concrete materials - Testing of workability of fresh concrete and determination of acceptability level.

Brick: Examination of bricks and identification of class designation.

Fine Aggregates: Sieve analysis, Specific gravity, Bulk density, etc.

Coarse Aggregate: Sieve analysis, Specific gravity, Bulk density, Crushing strength, etc.

Steel:

- Identification of standard steel sections with measurement of dimensions as per IS800 and SP6 (Steel Tables).
- Estimation of slenderness ratio of given steel sections (I-section, Channel section, etc.).
- Testing of reinforcement bars- tensile testing, percentage elongation.

Cement:
Initial setting time, Final setting time.

Bitumen:
Penetration test, Ductility test, Softening point test, Specific gravity test, Viscosity test, Flash and Fire point test, Float test, Water content test.

b) Computer Aided Design:
Preparation of 2D drawing (Plan and Elevation) of office buildings, etc. including foundation using Auto CAD.

c) Soil Test:
Moisture content test on soil, Specific gravity test, Dry density test, Atterberg limits.

d) Testing of fluid:
Velocity Measurement by Pitot Tubes (Static and Total), Pressure Measurement by Manometers, Measurement of discharge using Venturimeter, Orifice Meter, Notches and Weirs.

(D) CSE And IT Engineering

Computer Networks: Knowledge of networking cables and connectors, usage of networking devices (hubs, routers and switches), IP management for networking /sub-networking, sharing resources (files/printers) on network, knowledge of basic networking commands in Windows/Linux/Ubuntu.

Computer Programming in C/ C++ / JAVA / Python: Arithmetic, Relational, Logical and Bitwise Operators. Input, Output, Formatting and File I/O, Conditional Statements, Repeat Statements, Loops and Nested Loops, Arrays and Memory Organization, Strings, Multidimensional Arrays, Functions and Parameter Passing, Recursion and Recursive solutions, OOPs Concept: Classes and objects, Inheritance, Packages, Interfaces, Overriding, Overloading.

-------------------------------***------------------------

N.B. <u>The trade test will be based on the laboratory practical works conducted during B.E. / B. Tech. or equivalent courses.</u>

21/10/2022

Recruitment of Technical Officer (Group III) against Advt. No. 05/2018

Scheme of Competitive Written Examination :

Mode of Examination for the post of Technical Officer [Group III(3)]

There will be three papers. The Paper II and Paper III will be evaluated only for those candidates who secure the minimum threshold marks (to be determined by the Selection Committee) in Paper I.

Mode of Examination - OMR Based or Computer Based Objective Type Multiple Choice Examination

Medium of Questions - The questions will be set both in English and Hindi except the questions on English Language.

Standard of exam - Post Graduate Diploma / Post Graduation / B.E. /B.Tech level (based on the advertised qualification of the post).

Total No. of Questions - 200

Total Time Allotted - 3 Hours

Paper-I (Time Allotted — 1 hour):

Subject	No. of questions	Maximum Marks	Negative Marks
Mental Ability Test*	50	100 (two marks for every correct answer)	There will be no negative marks in this paper.

Mental Ability Test will be so devised so as to include General Intelligence, Quantitative Aptitude, Reasoning, Problem Solving, Situational Judgement, etc.

Paper-II (Time Allotted — 30 minutes):

Subject	No. of questions	Maximum Marks	Negative Marks
General Awareness	25	75 (three marks for every correct answer)	One Negative mark for every wrong answer
English Language	25	75 (three marks for every correct answer)	One Negative mark for every wrong answer

Paper-III (Time Allotted — 90 minutes):

Subject	No. of questions	Maximum Marks	Negative Marks
Concerned Subject	100	300 (three marks for every correct answer)	One Negative mark for every wrong answer

Syllabus of Competitive Written Examination :

(A) Mechanical / Manufacturing / Production:

Fundamentals of CAD and computer graphics. Drawing standards, advanced concepts of CAD software - blocks, UCS, 3D-line, 3D object, DXF & DXB file formats. Line drawing algorithms, mid-point circle algorithm. Geometrical Dimensioning and Tolerance. 2-D geometrical transforms - Translation, scaling, rotation, reflection and shear transformations. Matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. Boolean and sweep operations on primitives with applications to CAD of machine elements.

Various manufacturing systems – batch, mass, group, cellular and flexible manufacturing systems, CNC Machines - Introduction, classification, design and control features including interpolations. NC Part-Programming.

Definition and major classification of Casting; Casting materials, Sand mould casting - basic principles with simple examples of a solid casting and a hollow casting. Patterns - types, material and design including pattern allowances. Moulding sands - composition, preparation, properties and testing. Core - Purpose, definition, materials, preparation and applications. Design of gating system - pouring basin, sprue, runner and risers. Foundry equipment and furnaces. Principles, method, relative advantages and applications of shell mould casting, centrifugal casting, investment casting, Permanent mould casting. Casting defects - types, causes and remedy.

Major classes of joining - Mechanical joining, Welding, Brazing, Soldering and Adhesive bonding. Fusion welding - Introduction, basic principle, definition and major classification. Characteristics and applications of different fusion welding processes using different heat-sources: Gas welding; Electrical Arc welding. Different Arc weldings: Manual arc welding; Submerged arc welding; Tungsten Inert Gas (TIG) welding and Metal Inert Gas (MIG) welding; Plasma arc welding; Resistance welding. Laser beam welding and Electron beam welding. Solid state welding - principles, methods, requirements and application. Welding defects: Types, causes, effects and remedy.

Basic description of conventional machining processes, identification of process parameters, concept of machinability. Constructional configuration and specifications of basic machine tools like lathe, drilling machine, shaping machine, milling machine, grinding machine. Introduction to Grinding - Need and different methods of grinding, Wheel specifications, Mechanics of grinding,

Strength of materials – stress, strain and their relationship, Failure theories; Mohr's circle (stress), Deflection of beams, Bending and shear stresses in beams, Euler's theory of columns, Thick and thin cylinders, Torsion.

Theory of machines and mechanisms - Analysis of planar mechanisms, Cams and followers, Governors and fly wheels, Design of bolted, riveted and welded joints, Friction and lubrication, Design of shafts, keys, couplings, spur gears, belt drives, brakes and clutches.

Metrology – Limits, fits and tolerances, Linear and angular measurements.

Fluid mechanics – Fluid statics, Bernoulli's equation, Flow through pipes, Laminar and turbulent flows, Equations of continuity and momentum, Capillary action, Dimensional analysis.

Thermodynamics – zeroth, first and second laws of thermodynamics, Thermodynamic systems and processes, Calculation of work and heat for closed systems and control volumes, Air standard cycles, Vapour power cycle, Refrigeration cycle.

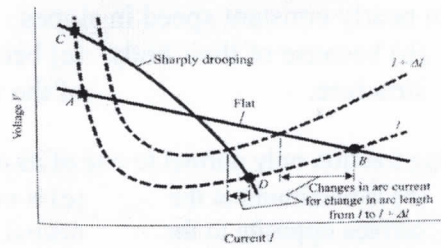Heat transfer – basic applications of conduction, convection and radiation.

Sample questions for written examination

1. The function of riser in casting process is

| (a) To compensate for the solid shrinkage | (b) To compensate for the liquid shrinkage and solidification shrinkage | (c) None of (a) and (b) | (d) Both (a) and (b) |

2.

The above figure shows typical voltage vs. current variation encountered in arc welding (dotted lines) and characteristics of two different power sources (solid lines). Which of the following statements are true?

| (a) The power source with the "Sharply drooping" Characteristics is suitable for manual metal arc welding (MMAW) | (b) The power source with the "Flat" Characteristics is suitable for gas metal arc welding (GMAW) | (c) None of (a) and (b) | (d) Both (a) and (b) |

3. By conventional machining of a tool steel work-piece having more than 45 HRC hardness, which of the following jobs (dimensions are in mm) may be difficult to produce?

| (a) | (b) | (c) Both (a) and (b) | (d) None of (a) and (b) |
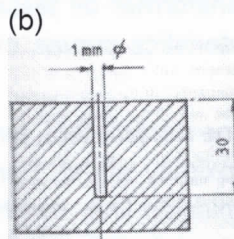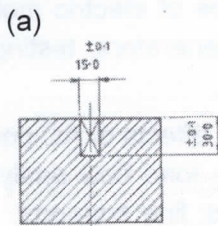
4. Coordinate of a point (represented as a matrix) in a 2 dimensional Cartesian coordinate system is [4 3]. What shall be the Homogeneous coordinate of the point?

| (a) [12 9 1/3] | (b) [4 3 0] | (c) [2 3 1] | (d) [-4 -3 1] |

5. Which of the following formats is most commonly used for programming in the CNC machine tools?

| (a) Fixed block format | (b) Escape sequence format | (c) Word address format | (d) None of the above |

6. Which option is correct?

| (a) For the same compression ratio, Otto cycle is more efficient than Diesel Cycle. | (b) For the same compression ratio, Diesel cycle is more efficient than Otto Cycle. | (c) For the same pressure ratio, Otto cycle is more efficient than Diesel Cycle. | (d) None of the options (a)-(c) is correct. |

7. Bernoulli's law for fluid motion says

| (a) Sum of kinetic energy and potential energy due to pressure of a certain volume of fluid flowing is constant. | (b) When pressure is applied in a static or confined fluid it is transmitted equally in all directions and acts perpendicular to the walls of the container. | (c) Sum of kinetic energy and, potential energy due to pressure and body force of a certain volume of fluid flowing is constant. | (d) Mass of fluid entering a control volume kept in a steady state is equal to the mass of fluid exiting. |

8. Fundamental deviation in relation to Metrology of *Engineering parts*
   (a) is the same as the tolerance.
   (b) is always kept as zero.
   (c) has no relation with *Fit* between the mating parts.
   (d) generally indicates the lower deviation.

9. Motorized vehicles can maintain nearly constant speed in slopes
   (a) with the assistance of Governor mechanism.
   (b) because of their body structure.
   (c) because of their size of the wheels.
   (d) all of the options (a) – (c).

10. Shear stress in a loaded beam having traction only normal to one of its outer surfaces
   (a) is maximum the surface being loaded.
   (b) is maximum at the surface opposite to the surface being loaded.
   (c) is maximum at the neutral layer.
   (d) None of the options (a) – (c).

* * *

(B) Electrical Engineering

Network Theorems: Kirchhoff's voltage and current laws, Thevenin's, Norton, Superposition and Maximum power transfer theorem, power in three phase circuits, frequency and power factor, three phases balanced and unbalanced circuits, star and delta networks circuits,

Electric Machine: Single and three phase distribution transformers, testing and maintenance of transformer, open circuit & short circuit testing, transformer oil testing, different type of electric motors (alternating current/ direct current), various characteristics curves of motors and generators, testing of motors brake test, heat run test etc.,

Power System: transmission line, classifications, line parameters, two-port network, effects of AC power transmission like corona discharge, skin effect, proximity effect, Ferranti effect etc, load flow analysis, over voltage (& under voltage) protection of transmission line, overhead conductors, line supports, line Insulators, safety regulation for high voltage testing, underground cables, earth resistance. Distribution, Feeder and classifications, distribution schemes: radial, ring, and grid, layout, power factor, vector diagram, AC distribution: Components classification, switchgear, relay differential, over current relay, circuit breakers, AGC, Solar PV system, different components, maintenance.,

Measurement & Instrumentation: Measurement of voltage, current, Electric Power and Electric Energy, CT and PT, PMMC and moving iron instrument, Earth tester, Digital Multimeter; L-C-R meter, Measurement of inductance/capacitance/Resistance Frequency meter, Phase sequence indicator, power factor meter. Measurement of different ranges of temperatures uses LVDT, RTD, Thermo couple, megger, insulation resistance testing. Lighting installation (residential, commercial and outdoors).

Sample Questions for written examination

1. While measuring power in a 3-phase load by two wattmeter method, the readings of two wattmeter are equal and opposite when
   a) power factor is unity
   b) load is balanced
   c) phase angle is between 60° and 90°
   d) the load is pure inductive.

2. The desirable static characteristics of a measuring system are
   a) Accuracy and reproducibility
   b) Accuracy, sensitivity and reproducibility
   c) Drift and dead zone
   d) Static error

3. Steady-state stability of a power system is the ability of the power system to
   a) Maintain voltage at the rated voltage level b) Maintain frequency exactly at 50 Hz c) Maintain a spinning reserve margin at all times d) Maintain synchronism between machines and on external tie lines

4. The main purpose of performing open-circuit test on a transformer is to measure its........

a) Cu loss   b) Core loss   c) Total loss   d) Insulation resistance

5. The sparking at the brushes, in a DC machine is due to
     a) Armature reaction   b) Reactance voltage
     c) Presence of commutator   d) High resistance of carbon brushes

6. A DC generator may lose a residual magnetism due to
     a) Heating   b) Vibrations   c) Over excitation   d) Any of the above

7. Sheaths are used in underground cables to
     a) Provide proper insulation   b) Provide mechanical strength
     c) Protect the cable from moisture   d) None of the above

8. The transient stability limit of a power system can be appreciably increased by introducing
     a) Series inductance   b) Series capacitance   c) Shunt inductance   d) Shunt capacitance

9. The coefficient of coupling between two air core coils depends on
     a) Self-inductance of two coils only   b) Mutual inductance between two coils only
     c) Mutual inductance and a self-inductance of two coils   d) None of the above

10. Constant voltage source is
     a) Active and bilateral   b) Passive and bilateral   c) Passive and unilateral   d) Active and unilateral

* * *

(C) CIVIL ENGINEERING

1. Structural Mechanics:

Engineering Mechanics: System of forces, free-body diagrams, equilibrium equations; internal forces in structures; Frictions and its applications; Centre of mass;

Solid Mechanics: Basics of the strength of materials. Types of stresses and strains. Bending moment and shear force in statically determinate beams; Simple stress relationships; simple bending theory, flexural and shear stresses, shear center; Uniform torsion, Transformation of stress; buckling of column, combined and direct bending stresses.

Structural Analysis: Statically determinate and indeterminate structures by force/energy methods; Method of superposition; Analysis of trusses, arches, beams, and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.

Construction Materials and Management: Construction Materials: Structural Steel – Composition, material properties and behavior; Concrete - Constituents, mix design, short-term and long-term properties. Construction Management: Types of construction projects; Project planning and network analysis - PERT and CPM; Concept of building planning (Plan, elevation and sectional view), Cost estimation, Bill of Materials, knowledge on latest Schedule of Rates for works. In-situ quality checking of building materials and workman ship.

Concrete Structures: Limit state design concepts; Design of beams, slabs, columns; Bond and development length; Limit state design for bending, shear, axial compression, and combined forces; Design of Lintels, Foundations, Retaining walls, Tanks, Staircases. Concept of relevant code provisions (IS 800 and IS 456).

Steel Structures: Limit state design concepts; Design of tension and compression members, beams and beam- columns, column bases; Connections - simple and eccentric, beam-column connections, plate girders and trusses.

2. Geotechnical Engineering

Soil Mechanics: Unified and Indian standard soil classification system; Permeability - one dimensional flow, Seepage through soils – two-dimensional flow, flow nets, uplift pressure, piping, capillarity, seepage force; Principle of effective stress and quicksand condition; Compaction of soils; One-dimensional consolidation, time rate of consolidation; Shear Strength.

Foundation Engineering Sub-surface investigations - Drilling bore holes, sampling, plate load test, standard penetration and cone penetration test, Earth pressure theories – Rankine and Coulomb, Stability of slopes –Pressure bulbs, Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table. Isolated, Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays; Deep foundations – dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading, pile group efficiency, negative skin friction.

3. Water Resources Engineering

Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum and energy equations and their applications; Potential flow, Laminar and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth.

Forces on immersed bodies; Flow measurement in channels and pipes; Energy-depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles.

4. Environmental Engineering

Water and Waste Water Quality and Treatment: Basics of water quality standards – Physical, chemical and biological parameters; Water quality index; Unit processes and operations; Water requirement; Water distribution system; Drinking water treatment.

Sewerage system design, quantity of domestic wastewater, primary and secondary treatment. Effluent discharge standards; Sludge disposal.

5. Transportation Engineering

Transportation Infrastructure: Geometric design of highways - cross-sectional elements, sight distances, horizontal and vertical alignments.

Highway Pavements: Highway materials - desirable properties and tests; Desirable properties of bituminous paving mixes; Design factors for flexible and rigid pavements; Design of flexible and rigid pavement using IRC codes

6. Geomatics Engineering

Principles of surveying - Errors and their adjustment; Maps - scale, coordinate system; Distance and angle measurement - Levelling and trigonometric levelling; Traversing and triangulation survey; Total station; Horizontal and vertical curves.

Sample Questions for written examination

1. In a rectangular channel, the ratio of the velocity head to the flow depth for critical flow condition, is

   (A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{3}{2}$ (D) 2

2. If a section shown in the figure turns from fully-elastic to fully-plastic, the depth of neutral axis (N.A.), $\bar{y}$, decreases by
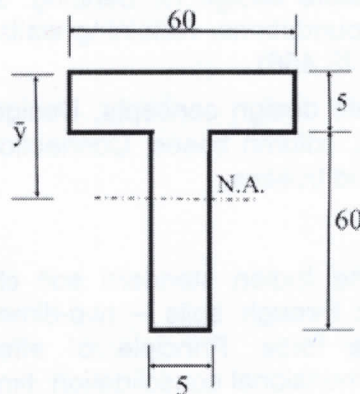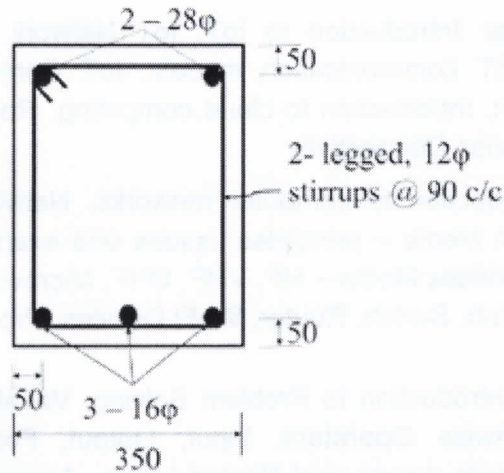

   (A) 10.75 mm   (B) 12.25 mm   (C) 13.75 mm   (D)15.25 mm

3. In the reinforced beam section shown in the figure (not drawn to scale), the nominal cover provided at the bottom of the beam as per IS 456-2000, is

2 – 28φ

50

2- legged, 12φ
stirrups @ 90 c/c

50

50
3 – 16φ

350

All dimensions are in mm

(A) 30 mm   (B) 36 mm   (C) 42 mm   (D) 50 mm

4. The interior angles of four triangles are given below:

Triangle	Interior Angles
P	$85°, 50°, 45°$
Q	$100°, 55°, 25°$
R	$100°, 45°, 35°$
S	$130°, 30°, 20°$

Which of the triangles are ill-conditioned and should be avoided in Triangulation surveys?
(A) Both P and R   (B) Both Q and R   (C) Both P and S   (D) Both Q and S

5. An element is subjected to biaxial normal tensile strains of 0.0030 and 0.0020. The normal strain in the plane of maximum shear strain is
(A) Zero   (B) 0.0010   (C) 0.0025   (D) 0.0050

6. In a soil specimen, the total stress, effective stress, hydraulic gradient and critical hydraulic gradient are σ, σ', i and i_c, respectively. For initiation of quick sand condition, which one of the following statements is TRUE?
(A) $\sigma' \neq 0 \ and \ i = i_c$ (B) $\sigma' = 0 \ and \ i = i_c$ (C) $\sigma' \neq 0 \ and \ i \neq i_c$ (D) $\sigma = 0 \ and \ i = i_c$

7. The maximum number of vehicles observed in any 5 minutes period during the peak hour is 160. If the total flow in the peak hour is 1000 vehicles, the 5 minute peak hour factor is
(A) 0.45 to 0.47   (B) 0.51 to 0.53   (C) 0.60 to 0.62   (D) 0.68 to 0.70

8. % elongation of steel is related to the property-
 (A) Ductility   (B) Compressive strength   (C) Hardness   (D) Tensile strength

9. For a steel beam of length L which is fixed at one end and free at the other end, the effective length is
          A) 0.65L   B) 1.2L   C) 2.0L   D) 0.8L

10. Drinking water has a BOD level of
A) 3 to 5 ppm   B) 1 to 2 ppm C) 6 to 9 ppm   D) 10 to 13 ppm

*   *   *

(D) CSE AND IT ENGINEERING

IoT and Cloud computing: Introduction to IoT, IoT Network Architecture and Design, Sensing, Actuation, IoT Protocols, IoT communication models, IoT Communication APIs, Building IoT with Arduino/Esp32/ Raspberry Pi, Introduction to cloud computing, Role of Cloud Computing in IoT, Cloud Storage for IoT, Cloud-to-Device Connectivity

Computer Networks: Introduction to computer networks. Network Models- OSI Reference Model, TCP/IP Model. Transmission Media – principles, issues and examples. Wired Media – Coaxial, UTP, STP, Fiber Optic Cables. Wireless Media – HF, VHF, UHF, Microwave; Network topologies. Functioning of Network Devices – NIC, Hub, Switch, Router, Wi-Fi Devices. Protocols: ARP, RARP, DCHP, BOOTP, ICMP

Computer Programming: Introduction to Problem Solving, Variables and Representation, Arithmetic, Relational, Logical and Bitwise Operators. Input, Output, Formatting and File I/O, Conditional Statements, Repeat Statements, Loops and Nested Loops, Arrays and Memory Organization, Strings, Multidimensional Arrays, Functions and Parameter Passing, Recursion and Recursive solutions, OOPs Concept: Classes and objects, Inheritance, Packages, Interfaces, Overriding, Overloading.

Programming Languages: Variables and Data Types, Control Structures, Functions, Modules and Packages, File I/O, Exception handling, GUI Programming, Text Processing, Regular Expressions and Frameworks in languages like JAVA and C.

DBMS: SQL: Introduction to MS SQL/MySQL, Schema definition, Constraints, Queries, and Views, Security, programming techniques, Functional dependencies and normalization for relational databases.

Sample Questions for written examination

1. An IoT system: Collect->Communicate->_____->Act
   a) Acknowledge   b) Analyze   c) Examine   d) Rectify

2. Which of the following is false about IoT devices?
   a) IoT devices use the internet for collecting and sharing data
   b) IoT devices need microcontrollers
   c) IoT devices may use wireless technology
   d) IoT devices are completely safe

3. Which network topology requires a central controller or hub?
   a) Star b) Mesh c) Ring d) Bus

4. Which of this is not a guided media?
   a) Fiber optical cable   b) Coaxial cable   c) Wireless LAN   d) Copper wire

5. Examine the following code. How many times will the nested loop run?
   for (int i=1; i<=3; i++){ for (int j=1; j<=i; j++){ } }
   a) 3   b) 6   c) 1   d) 9

6. A class member declared protected becomes a member of subclass of which type?
   a) public member   b) private member   c) protected member   d) static member

7. In Java, source program is compiled to an intermediate form called _____
   a) Byte Code   b) Smart code   c) Executable code   d) Machine code

8. JVM stands for?
   a) Java virtual machine   b) Java visual machine
   c) JRE virtual machine   d) JRE visual machine

9. The restrictions placed on the data.
   a) Relation   b) Attribute   c) Parameter   d) Constraint

10. SQL is _____
   a) Relational   b) Network   c) IMS   d) Hierarchical

*   *   *

(E) MENTAL ABILITY

This component may include questions on analogies, similarities and differences, space visualization, spatial orientation, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning and figural classification, arithmetic number series, non-verbal series, coding and decoding, statement conclusion, syllogistic reasoning etc.

Data interpretation: data graphs (bar graphs, pie charts, and other graphs representing data), 2-and 3-dimensional plots, maps, and tables Numerical computation and estimation: ratios, percentages, powers, exponents and logarithms, permutations and combinations, Mensuration and geometry, Elementary statistics and probability.

Sample Questions for written examination

01. If 5 – 5 =24 and 7 – 7 =48 then find the value of 10 – 10 =?
   (a) 80   (b) 99   (c) 91   (d) 56

02. In the following question, which one set of letters when sequentially placed at the gaps in the given letter series shall complete it?
c_e_cd_f_d_f
   (a) dfcec   (b) dfece   (c) cfede   (d) cdfed

03. In the following question, select the missing number from the given series.

6	5	4
8	10	6
2	1	?

   (a) 10   (b) 6   (c) 7   (d) 8

04. If it is Sunday on the 2nd of a month, then what day will it be on the 31st of the same month?
   (a) Tuesday   (b) Saturday   (c) Friday   (d) Monday

05. Radhika went 50 meters south from her house, then turned left and went 20 meters, then turned north and went 30 meters. In which direction is his house from this place?
   (a) North   (b) South-west   (c) East   (d) North- West

06. Study the following table carefully to answer the following:
Number of employees promoted to the post of Manager in six different banks over the years

Bank / Year	Luck Bank	Maha Bank	Nag Bank	Oris Bank	Punj Bank	Del Bank
2017	48	46	52	44	37	39
2018	50	47	50	32	44	46
2019	46	40	50	42	38	35
2020	38	48	36	51	35	39
2021	32	44	46	45	48	40
2022	52	39	47	41	46	43

What is the percent increase in the number of employees promoted by Del Bank in 2018 from the previous year ? (rounded off to two digits after decimal)

    (a) 16.23   (b) 15.84   (c) 17.95   (d) 18.68

07. If A stands for '×', B stands for '−', C stands for '+' what is the value of (9 C 5) A (6 C 6)= ?

    (a) 81   (b) 168   (c) 162   (d) None of these

08. The question given below has a set of three or four statements. Each set of statements is further divided into three segments. Choose the alternative where the third segment in the statement can be logically deduced using both the preceding two, but not just from one of them.

Statement –
    I. All fruits are lions
    II. All lions are foxes
    III. Some foxes are beggars

Conclusion –
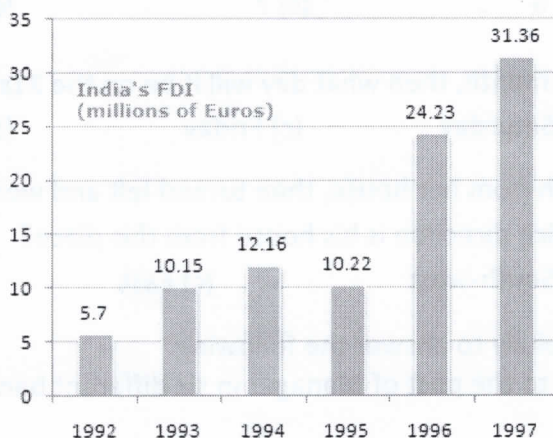   I. All fruits are foxes.
    II. Some fruits are beggars.
    a. Only I follows   b. Only II follows   c. Only I & II follows   d. None of these

09. In the following question, four words have been given, out of which three are alike in some manner and the fourth one is different. Choose out the odd one.

(a)Quintal   (b)Kilogram   (c) Gallon   (d) Ton

10 The following bar chart shows the trends of foreign direct investments(FDI) into India from all over the world.

Trends of FDI in India

India's FDI (millions of Euros)

1992: 5.7, 1993: 10.15, 1994: 12.16, 1995: 10.22, 1996: 24.23, 1997: 31.36

What was the ratio of investment in 1997 over the investment in 1992?

    (a) 5.50   (b) 5.36   (c) 5.64   (d) 5.75

(F) General Awareness

Questions in this component will be aimed at testing the candidates' general awareness of the environment around him, ecology and its application to society. Questions will also be designed to test knowledge of current events and of such matters of every day observations and experience in their scientific aspect as may be expected of any educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to Economic Scene, General Policy, Scientific Research and also Indian Constitution.

Sample Questions for written examination

1. Vast majority of electricity from nuclear power, considered as much cleaner in comparison to fossil fuels is produced using:
    a. Nuclear fusion   b. Nuclear fission   c. Nuclear Decay   d. Nuclear Radiation

2. Which of the following is an Indirect Tax in India?
    a. Goods and Services Tax   b. Corporation Tax   c. Income Tax   d. Capital Gains Tax

3. The largest source of anthropogenic methane emission is:
    a. Agriculture   b. Waste   c. Biomass burning   d. Coal based power plants

4. Who is the Current CEO of Microsoft?
    a. Babbage   b. Bill Gates   c. Bill Clinton   d. Satya Nadella

5. Article 19 of our Constitution guarantees to all citizens the six rights. Which of the following rights is not included there?
    a. Right to freedom of speech and expression   b. Right to form associations or unions
    c. Right to practice any profession or carry on any occupation, trade or business
    d. Right to acquire, hold and dispose of property

6. Which of the Following Have Higher Energy Levels and Shorter Wavelengths?
    a. Infrared radiation   b. Ultraviolet radiation c. Gamma radiation   d. X ray

7. Photoelectric effect was explained by
    a. Einstein   b. Faraday   c. Plank   d. Hertz

8. We Think Digital' is a digital literacy program of which global technological company?
    a. Google   b. Facebook   c. Apple   d. Amazon

9. The 'COVID-19 Sample Collection Kiosk' (COVSACK), which was seen in news recently, was developed by the laboratory of which institution?
    a. Defence Research and Development Organisation   b. Hindustan Aeronautics Limited
    c. Bharat Electronics Limited   d. Bharat Heavy Electricals Limited

10. Which of the following are environment-friendly practices?
a) Carrying a cloth-bag to put purchases in while shopping.   b) Switching off unnecessary lights and fans.
c) Walking to school instead of getting your mother to drop you on her scooter.   d) All of the above.

* * *

(G) English Language

Basic English grammar: tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech. Basic vocabulary: words, idioms, and phrases in context, Reading and comprehension, Narrative sequencing, spot the error, fill in the blanks and cloze test.

Sample Questions for written examination

1.----------------- me about your problem, I would have helped you.
a. If you have told
b. Had you told
c. If you would have told
d. Had you have told

2. Cloze test:

Childhood is a time where there are ---1---- responsibilities to make life difficult. If a child-----2----- good parents, he is fed, looked -----3----- and loved. Whatever he may do, it is improbable that he will ever again in his life ----4----- given so much without having to do anything ----5---- return. In addition, life is always ------6----- new things to the child. A child finds -------7------in playing in the rain or in the snow. His first visit -------8------- the seaside is a marvellous adventure. But a child has pains; he is not so free to do as he wishes; he is continuously being ------9----- not to do things or is being -----10------. His life is therefore not perfectly happy.

1. a) few b) little c)many d)lots e) too many
2. a) have b)has c)had d)is e)was
3. a)about b)over c)after d)around e)above
4. a) be b)was c)were d)has e)had
5. a) for b)in c)over d)from e) on
6. a) doing b)giving c)taking d) making e)presenting
7. a)wet b)dry c) pleasure d)pain e)inviting
8. a) to b) from c)at d)on e)over
9. a)found b)forbidden c)asked d)ordered e)appealed
10. a) played b) gifted c) punished d)rewarded e) remained

3. Select the antonym of the given word: EMINENT
    a. distinguished
    b. exalted
    c. impressive
    d. inconspicuous

4. In the sentence identify the segment which contains the grammatical error. Cyclone Idai is regarded as one of the worst tropical cyclone on record to affect Africa and the Southern Hemisphere as a whole.
    a. Cyclone Idai is regarded
    b. as a whole
    c. to affect Africa
    d. the worst tropical cyclone

5. Select the most appropriate meaning of the given idiom: pull yourself together
    a. go to sleep
    b. try to understand
    c. do a good job
    d. calm down

6. Read the given passage carefully and answer the following questions:

All historians are interpreters of text if they be private letters, Government records or parish birth lists or whatever. For most kinds of historians, these are only the necessary means to understanding something other than the texts themselves, such as a political action or a historical trend, whereas for the intellectual historian, a full understanding of his chosen texts is itself the aim of his enquiries. Of course, the intellectual history is particularly prone to draw on the focus of other disciplines that are habitually interpreting texts for purposes of their own, probing the reasoning that ostensibly connects premises and conclusions. Furthermore, the boundaries with adjacent sub disciplines are shifting and indistinct: the history of art and the history of science both claim a certain autonomy, partly just because they require specialised technical skills, but both can also be seen as part of a wider intellectual history, as is evident when one considers, for example, the common stock of knowledge about cosmological beliefs or moral ideals of a period.

Like all historians, the intellectual historian is a consumer rather than a producer of methods. His distinctiveness lies in which aspect of the past he is trying to illuminate, not in having exclusive possession of either a corpus of evidence or a body of techniques. That being said, it does seem that the label 'intellectual history' attracts a disproportionate share of misunderstanding.

I. An intellectual historian aims to fully understand
(a) the chosen texts of his own   (b) political actions   (c) historical trends   (d) his enquiries

II. Intellectual historians do not claim exclusive possession of
(a) conclusions   (b) any corpus of evidence   (c) distinctiveness   (d) habitual interpretation

7. Fill in the blanks:
The summer climate is the _____ in the Australian states.
     a) more cool   b) more cooler   c) coolest   d) cooler

8. Fill in the blanks with the suitable tense of the given verb:
Bruno and Marcela met at a medical assembly, which Marcela _____ for a long time (attend).
     (a) was attending   (b) has been attending   (c) have been attending   (d) had been attending

9. Choose the part of the sentence with the error:
Every one of the films/ you suggested/ are not worth seeing.
(a) Every one of the films   (b) you suggested   (c) are not worth seeing   (d) no error

10. Find the most appropriate synonym for the word 'RECUPERATE':

(a) Rehabilitate
(b) Recover
(c) Reimburse
(d) Relocate

N.B. The above syllabus and sample questions are indicative in nature.