ANDHRA PRADESH PUBLIC SERVICE COMMISSION :: VIJAYAWADA

Notification No.08.2018

SPECIAL QUALIFYING TEST FOR APPOINTMENT BY PROMOTION FOR NON – TEACHING STAFF OF THE DEPARTMENT OF TECHNICAL EDUCATION.

PARA – 1:

Applications are invited On-line from Non – teaching staff of the department of Technical Education who are appointed by promotion as Lecturers in Government Polytechnic Colleges.

The proforma Application will be available on Commission's Website *(www.psc.ap.gov.in) from* ***24.08.2018 to 14.09.2018 (Note:13.09.2018*** **is the last date for payment of fee up- to 11:59 mid night).**

Before applying for the test, an applicant shall register his/her bio-data particulars through One Time Profile Registration *(OTPR)* on the Commission's Website viz., www.psc.ap.gov.in. Once applicant registers his/her particulars, a User ID is generated and sent to his/her registered mobile number and email ID. Applicants need to apply for the test using the OTPR User ID through Commission's website.

Hand written / Typed /Photostat copies/Printed Application Form will not be entertained either directly or by post Office or in person.

The Examination is likely to be held On-Line through computer based test on **28.10.2018.** There would be objective type questions which are to be answered on computer system. Instructions regarding computer based test are attached as **Annexure – II**.

PARA-2

Eligibility to appear for the Test

1. Only the Non – teaching staff working in the department of Technical Education and governed by AP Technical Educational Service Rules issued in G.O.Ms.No.178, Higher Education (TE.1A) Dept.,dt:09.12.2005 and amended through G.O.Ms.No.254, Higher Education (TE.1) Dept., dt:30.10.2008 who are appointed by promotion as Lecturers in Government Polytechnic Colleges.
2. **Special condition prescribed for test:** The applicants who are working in the Department of Technical Education the service certificate given below shall be fill and get the signature with seal of the controlling Officer of Department. The service certificate duly signed by the controlling officer should be scanned and uploaded. Otherwise their applications will be summarily rejected.

Service Certificate

This is to certify that Sri./Smt./Kum._____is working as _____From_____to_____(Total service rendered_____)In the office of_____.

Station: Signature:

Date: Name and Designation of Controlling Officer With Office seal (if signed by the Controlling Officer, the application will be rejected.

3. **Educational Qualification:**

As per the G.O.Ms.No.254, Higher Education (TE.1) Dept., dt: 30.10.2008 apart from the following required academic qualification, one must also qualify in the Special Qualifying Test to be conducted by the A.P. Public Service Commission.

S.No	Name of the post	Qualification
1	Lecturers in Electrical Electronics Engineering	Must possess a First Class Bachelor's Degree in the appropriate Branch of Engineering/Technology as recognized by All India Council for Technical Education or its equivalent.
2	Lecturers in Electronics & Communication Engineering	
3	Lecturers in Civil Engineering	
4	Lecturers in Mechanical Engineering	
5	Lecturers in Computer Engineering	
6	(a) Lecturers in Commercial & Computer Practice (to teach commerce, Typewriting and Short hand subjects) (b) Lecturers in Commercial and Computer Practice (to teach Computer Practice)	i) Must possess 1st class Master Degree in Commerce. ii) Typewriting in Higher Grade in English and Shorthand Higher Grade in English Conducted by the State Board of Technical Education and Training. i) Must possess Bachelor's Degree in Commerce ii) Must possess 1st class Master's Degree in Computer application (MCA) from an institution recognized by all India Council for Technical Education.
7	Lecturers in English	A First Class Master's Degree in English from an University in India recognized by UGC.
8	Lecturers in Mathematics	A First Class Master's Degree in Mathematics from an University in India recognized by UGC.
9	Lecturers in Pharmacy	A First Class Bachelor's Degree in Pharmacy from an University in India recognized by UGC or AICTE
10	Lecturers in Chemistry	A First Class Master's Degree in Chemistry from an University in India recognized by UGC.

Note: Relaxation of 5% marks is available for the candidates belonging to SC/ST, i.e., 55% marks is enough for the purpose of eligibility.

PARA-3

Scheme of Examination

PART-A:	**Written (Objective Type) Examination**:			
Paper-1	General Studies & Mental ability	150 Marks.	150 Qns.	150 Minutes
Paper-2	Concerned Subject	300 Marks.	150 Qns.	150 Minutes
PART-B: **ORAL TEST** (Interview)		50 Marks		

NOTE- I. As per G.O.Ms. No.235 Finance (HR-1, Plg & Policy) Dept, Dt:06/12/2016, for each wrong answer will be penalized with 1/3rd of the marks prescribed for the question.

2. The minimum qualifying marks in the examination for consideration of a candidate for qualifying in case of OC category is 40%, BC category is 35% and for SC, ST and PH categories is 30% or as per the relevant rules.

3. The paper in concerned subject for Engineering streams is of Engineering Bachelor's degree standard.
4. The paper in the concerned subject for Non-Engineering streams is of P.G. Degree standard
5. The Question papers will be in English only.

Since issue of the G.O.Ms.No.254, Higher Education (TE.1) Dept., dated: 30.10.2008, the number of Employees appointed by promotion to the post of Lecturers as informed by the Department is as hereunder:

S.No	Name of the post and subject
1	Lecturers in Electrical Electronics Engineering
2	Lecturers in Electronics & Communication Engineering
3	Lecturers in Civil Engineering
4	Lecturers in Mechanical Engineering
5	Lecturers in Computer Engineering
6	Lecturers in Commercial & Computer Practice
7	Lecturers in English
8	Lecturers in Mathematics
9	Lecturers in Pharmacy
10	Lecturers in Chemistry

PARA - 4 HOW TO APPLY:

STEP-I: Candidates applying for the first time for any notification has to first fill the OTPR application carefully to obtain OTPR ID. While filling the OTPR, the candidates has to ensure that there are no mistakes done. The Commission bears no responsibility for the mistakes, if any, made by the candidates.

STEP-II: The Applicant has to Login in the Commission's website with the User Name (OTPR ID) and the Password set by Candidate. After Login, the Applicant has to click on the "Online Application Submission" present in the bottom right corner of the commission's website.

PAYMENT PROCESS: The Applicant now has to click on the payment link against the Notification No.08/2018. The Basic details required for calculation of the Fee will be prepopulated from the OTPR data. The Applicant has to verify all the details that were displayed. **Once the Payment form is submitted, the respective details (Used for Calculation of fee) will not be altered in any stage of application processing.** Hence if any details are to be changed, applicant should use the Modify OTPR link, modify the details, save it and again click on application payment link.

STEP-III: After checking all the data and ensuring that the data is correct the applicant has to fill application specific data. Once all the data is filled appropriately, the applicant has to submit the payment form. On successful submission, the payment reference ID is generated and is displayed on the screen. By clicking "OK" the Applicant is shown the various payment options where he/she can select any one among them and complete the payment process as given on the screen.

STEP-IV: Once the payment is successful, payment reference ID is generated. Candidates can note the payment reference ID for future correspondence. Thereafter the applicant is directed to the application form. Applicant should provide the payment reference Id generated along with the other details required for filing the application form (other fields like OTPR ID and personal details will be prepopulated

from the data submitted in the payment form for respective notification). The Applicant should check the data displayed thoroughly and should fill the application specific fields like subject details, Qualification details, examination centre etc., details carefully and submit the Application form. Once the Application is submitted successfully then Application Receipt is generated. The Applicant is requested to print and save the application receipt for future reference/correspondence.

NOTE: Applicant shall note that, the details displayed from OTPR at the time of submitting the application will be considered for the purpose of this notification only. If, any changes are made by the applicant to OTPR data at a later date will not be considered in any case.

STEP-V: In any case if the payment process is not submitted successfully, then the applicant should start the fresh payment process as mentioned in STEP-II.

STEP-VI: Once the application is submitted successfully, correction in application form will be enabled. The corrections can be made in the application form itself for subject only. Fields which affects the Name, fee are not enabled for corrections.

NOTE:

The Commission is not responsible, for any omissions by the applicant in bio-data particulars while submitting the application form On-Line. The applicants are therefore, advised to strictly follow the instructions given in the User guide before submitting the application.

All the candidates are requested to submit their application with correct data. It is noticed that some of the candidates are requesting for change in the data, after submission of the application. It is informed that such requests shall be allowed on payment of Rs.100/- (Rupees Hundred Only) for each correction. However changes are not allowed for Name, personal details and Fee. No manual application for corrections shall not be entertained. No changes will be allowed after 2 days of last date of applications.

The particulars furnished by the applicant in the Application Form will be taken as final, and data entry processed, based on these particulars only by application system. Applicants should, therefore, be very careful in Uploading / Submitting the Application Form Online.

Before Uploading/Submission Application Form, the Candidates should carefully ensure his/her eligibility for this examination. NO RELEVANT COLUMN OF THE APPLICATION FORM SHOULD BE LEFT BLANK; OTHERWISE APPLICATION FORM WILL NOT BE ACCEPTED.

INCOMPLETE/INCORRECT APPLICATION FORM WILL BE SUMMARILY REJECTED. THE INFORMATION IF ANY FURNISHED BY THE CANDIDATE SUBSEQUENTLY WILL NOT BE ENTERTAINED BY THE COMMISSION UNDER ANY CIRCUMSTANCES. APPLICANTS SHOULD BE CAREFUL IN FILLING-UP THE APPLICATION FORM AND SUBMISSION.

Applicant shall note that, the details available with OTPR data base at the time of submitting the application will be considered for the purpose of this notification. If, any changes are made by the applicant to OTPR data base at a later date will not be considered for the purpose of this notification.

For any Technical problems related to online submission and downloading of Hall Tickets please contact 08662527820 and 08662527821 (Call Time 10.00 AM to 1.00 PM and 01.30 PM to 5.30 PM) at working days or mail to appschelpdesk@gmail.com

PARA - 5: (a) FEE:

Applicant must pay Rs. 500/- (Rupees Five Hundred Only) towards application processing fee and Rs 200/- (Rupees Two Hundred only) towards Examination Fee.

b) Mode of Payment of Fee:

i) The Examination Fee mentioned in the above paragraph is to be paid online using Payment Gateway using Net Banking/ Credit card / Debit Card. The list of Banks providing service for the purpose of online remittance of Fee will be available on the Website.

ii) The fee once remitted shall not be refunded or adjusted under any circumstances. Failure to pay the examination fee and application fee (in non-exempt case) will entail total rejection of application.

iii) IPOs / Demand Drafts are not accepted.

iv) In case of corrections Rs.100/- per correction will be charged. However changes are not allowed for Name, Fee.

PARA- 6 : SYLLABUS:- The Syllabus for the examination has been shown in Annexure-I.

PARA - 7 : CENTRES FOR THE ON-LINE EXAMINATION (WRITTEN):

The Examination will be held at **Vijayawada only**. However the Commission reserves the right to allot the applicant to any centre or duly creating a new centre for administrative reasons of examination depending on the availability of the resources like centres / systems.

RESOLUTION OF DISPUTES RELATED TO QUESTION PAPER, ANSWER KEY AND OTHER MATTER

The Commission would publish on its website, the key, after conduct of the examination. Any objections with regard to the key and any other matter shall be filed within one week, of the publication of the key on the website of the Commission, in the prescribed proforma available in the website.

The objections received in the prescribed proforma and within due date will be referred to expert Committee for opinion and to take appropriate decision thereon by the Commission. As per decision of the Commission a revised key will be hosted and further objections only in respect of keys that are revised would be called for period of three working days from the date of publication of revised key. No further objections on original key will be entertained at this stage. The matter will again refer to experts, taking into consideration of opinion of expert Committee, the final key would be hosted on website based on the decision of the Commission.

The objections if any would be examined and the decision of the Commission in this regard shall be final. Any objection filed after expiry of specified time from the date of publication of key / revised key would not be entertained.

DEBARMENT:

- Candidates should make sure of their eligibility to the post applied for and that the declaration made by them in the format of application regarding their eligibility is correct in all respects. Any candidate furnishing in-correct information or making false declaration regarding his/her eligibility at any stage or suppressing any information is liable TO BE DEBARRED UPTO FIVE YEARS FROM APPEARING FOR ANY OF THE EXAMINATIONS CONDUCTED BY THE COMMISSION, and summary rejection of their candidature for this recruitment.
- The Penal Provisions of Act 25/97 published in the A.P. Gazette No. 35, Part-IV.B Extraordinary dated: 21/08/1997 shall be invoked if malpractice and unfair means are noticed at any stage of the recruitment. Further candidates shall be liable for penalty as per G.O.Ms.No.385, G.A. (Services. A) Dept., Dt.18/10/2016. The Chief Superintendent of the examination centre is authorized to take decision in case of malpractice or usage of unfair means or creation of disturbance or use of physical force by any candidate and report the matter to the competent authority as well as register a police case.
- The Commission is vested with the constitutional duty of conducting examination as per rules duly maintaining utmost secrecy and confidentiality in this process and any attempt by anyone causing or likely to cause breach of this constitutional duty in such manner or by such action as to violate or likely to violate the fair practices followed and ensured by the Commission will be sufficient cause for rendering such questionable means as ground for debarment and penal consequences as per law and rules as per decision of the Commission.

- If any candidate is or has been found impersonating or procuring impersonation by any person or resorting to any other irregular or improper means in connection with his / her candidature for selection or obtaining support of candidature by any means, such a candidate may in addition to rendering himself/ herself liable to criminal prosecution, be liable to be debarred permanently from any exam or selection held by the Service Commissions in the country.
- **MEMORANDUM OF MARKS:** Answer key would be published on the website and also as marks of each candidate are also displayed on website. No separate memorandum of marks would be issued.

PARA-8: COMMISSION'S DECISION TO BE FINAL:

The decision of the Commission in all aspects and all respects pertaining to the application and its acceptance or rejection as the case may be, conduct of examination and at all consequent stages culminating in the selection or otherwise of any candidate shall be final in all respects and binding on all concerned, under the powers vested with it under Article 315 and 320 of the Constitution of India. Commission also reserves its right to alter and modify the terms and conditions laid down in the notification for conducting the various stages up to selection, duly intimating details thereof to all concerned, as warranted by any unforeseen circumstances arising during the course of this process, or as deemed necessary by the Commission at any stage.

Place: VIJAYAWADA **Sd/-**

Date:16.08.2018 **SECRETARY (FAC)**

ANNEXURE – I

SCHEME AND SYLLABUS FOR SPECIAL QUALIFYING TEST (Notifn.No.08/2018)

SCHEME

PART-A:	**Written (Objective Type) Examination**:			
Paper-1	General Studies & Mental ability	150 Marks.	150 Qns.	150 Minutes
Paper-2	Concerned Subject	300 Marks.	150 Qns.	150 Minutes
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NOTE- As per G.O.Ms. No.235 Finance (HR-1, Plg & Policy) Dept, Dt:06/12/2016, for each wrong answer will be penalized with 1/3rd of the marks prescribed for the question.				

N.B: 1. The paper in concerned subject for Engineering streams is of Engineering **Bachelor's degree** standard.
2. The paper in the concerned subject for Non-Engineering streams is of **P.G. standard**
3. The Question papers will be in English only.

Name of the Subject	
1. Electrical & Electronics Engineering	6. Commercial and Computer Practice
2. Electronics & Communication Engineering	7. English
3. Civil Engineering	8. Mathematics
4. Mechanical Engineering	9. Pharmacy
5. Computer Engineering	10. Chemistry

SYLLABUS

Paper-I

GENERAL STUDIES AND MENTAL ABILITY

I. General Science – Contemporary developments in Science and Technology and their implications including matters of every day observation and experience, as may be expected of a well-educated person who has not made a special study of any scientific discipline.

II. Current events of national and international importance.

III. History of India – emphasis will be on broad general understanding of the subject in its social, economic, cultural and political aspects with a focus on AP Indian National Movement.

IV. World Geography and Geography of India with a focus on AP.

V. Indian polity and Economy – including the country's political system- rural development – Planning and economic reforms in India.

VI. Mental ability – reasoning and inferences.

VII. DISASTER MANAGEMENT (Source : CBSE Publications)

1. Concepts in disaster management and vulnerability profile of India / State of A.P.
2. Earth quakes / Cyclones / Tsunami / Floods / Drought – causes and effects.
3. Man made disasters - Prevention strategies.
4. Mitigation strategies / Mitigation measures.

PAPER-II CONCERNED SUBJECT

1. ELECTRICAL AND ELECTRONICS ENGINEERING

01. ELECTRIC CIRCUITS, FIELDS & MEASUREMENTS:

Network elements – Ohm's law and Kirchoff's laws – formation of mesh and nodal equations – topological description of networks – response of R, L and C elements to arbitrary excitations – Laplace transform method of analysing networks.

Network theorems – superposition, Thevenin's Norton's theorems – Maximum power transfer thereciprocity theorem – applications – two port parameters – Z, Y, ABCD, H para meters – their relationships.

A.C. Circuits – single phase circuits – J-notation – calculations – resonance – Polyphase – circuits – measurements of polyphase power.

Electromagnetic theory – general relations in static fields – potential gradient and field intensity

– flux density – Gauss's law – Poisson and Laplace equations – relations in electromagnetic fields – ampere's law – flux and flux density – divergence and curl – vector magnetic potential.

Electrical measurements – Types of measuring instruments – Principles of operation – extension of ranges – instrument transformers.

02. CONTROL SYSTEMS, COMPUTATION AND ELECTRONICS

Control systems – Types of servo mechanisms – equations and models of linear systems – block diagrams – time response of second order systems – stability criteria – root locus technique – frequency response – Nyquist criterion – Bode plots.

Elements of computation: Digital systems – flow charts and algorithms – FORTRAN – types of statements – logical expressions – Assignment statements – program structure – Scientific and Engineering applications.

Electronics: Solid-state devices and circuits – small signal amplifier design – feedback amplifiers

– Oscillators – FETS – Thyristors.

03. ELECTRICAL MACHINES:

Principles of Electromechanical Energy Conversion: Basic ideas of production of torque – concepts of generation of voltages – formulae for voltage and torque production.

Three phase induction motors: The revolving field theory – Principles of operation of induction motor – torque equation – Computation of performance – torque speed characteristics – motor starters – conventional and thyristor controllers for speed control of induction motors.

Single phase motors: Revolving field theory – types of single-phase motors – equivalent circuits - speed control – applications.

Synchronous machines: Generation of 3-phase voltages – types of synchronous machines – equivalent circuit – experimental determination of reactances – voltage regulation and efficiency

– parallel operation – transient and subtransient reactances – synchronous motors – theory of operation - -phase of diagram – equivalent circuit – performance and power factor control – applications.

Special machines: Two phase servomotors – stepper motors – methods of operation – metadyne and amplidyne – operating characteristics and applications.

D.C. Machines and Transformers.

04. POWER SYSTEMS:

Generation: Methods of power generation – steam, hydro, nuclear, diesel – selection of site for each – general layout of each type – function of each component – economics of different types

– base and peak load stations – pumped stations – simple calculations in hydro station design. Transmission: A.C. Vs. D.C. transmission – criteria for selection of voltages – transmission line parameters – G.M.D. and G.M.R – concepts for short, medium and long lines – line calculations
– A.B.C and D constance – load flow analysis – surge impedance loading.
Corona and insulators: production of corona – disruptive and visual corona – corona loss – methods to avoid corona – types of insulators – string efficiency.

Fault analysis: Per unit representation: fault analysis – Symmetrical and unsymmetrical faults – application of symmetrical components – reactors.

Protection: Switch gear – methods of arc extinction – classification of circuit breakers – definitions – calculations in switch gear – testing of circuit breakers – Relaying principles – primary and back up relaying – definitions – operation of different types of relays – applications to line, transformer and generator protection – protection of lines and equipment against voltage surges – travelling wave theory.

Utilisation: Industrial drives – motors for various applications – braking – methods of heating and welding – welding transformer – Economics and other aspects of track electrification.

2.ELECTRONICS & COMMUNICATION ENGINEERING

01. Network analysis, Topology, Tree Tieset out set, first and Second order Circuits. Steady State and Transient response, Sinusoidal steady State Analysis.
Series and parallel Resonance, Network Theorems, Laplace Transforms, Fourier series, Fourier Transforms – Applications, Two port.

Network Parameters, Interconnection of two ports, Image Impedance, Image Parameters. Filters – constant K and M derived sections. Electronics Devices – Diodes, Transistors, FET biasing, and characteristics, Frequency, Response, Amplifier circuits.

Electro Magnetic Theory – Maxell's Equations. Coulomb's law, Amper's law , Faraday's law, Poynting Energy Theorem, Stoke's theorem, uniform plane waves.

Transmission Line Theory – Standing waves & Travelling waves, Reflection, VSWR.

02. Feedback Amplifiers and oscillator Circuits Wave Shaping circuits, Logic Gates, Boolean Theorems, Adders & Subtractors. Antennas & Propagation – Radiation Principle, Antenna parameters.
Definitions.

Directional Antennas, Linear Antenna Arrays, Broadside & End fire Arrays, Gain, Directivity, Radiation pattern.

Ground Wave, Sky Wave, Ionosphere Propagation, Guided Waves, Rectangular Wave-Guide Analysis, Microwave Circuits and Components.

Microwave Tubes, Klystron, Magnetron, and TWT.

Modulation Techniques – AM, FM, PM. Channel capacity, Noise, AM, FM, Transmitters, Radio Receivers.

TV and Satellite Communication – Principles Radar Equation and Applications of Radar Computer Programming, FORTRAN, BASIC, PASCAL, Are Programming languages.

3. C I V I L E N G I N E E R I N G

01. ANALYSIS OF STRUCTURES:

Sending stresses and shear stresses in beams; Deflection and slope of beams;

Combined bending and direct stresses; axially and eccentrically loaded columns;

Close-Coiled and open-coiled; helical springs under axial load and axial twist; carriage springs; Analysis thin and thick cylinders; compound cylinders;

Analysis of statically determinate plane trusses; method of joints and method of sections. Analysis of statically indeterminate beams; proposed canti-levers, fixed beams and continuous beams.

Strain energy method, slope-deflection method, moment distribution method and Kaini's method of analysis of indeterminate structures.

Influence lines and moving loads on beams and simple bridge trusses.

02. STRUCTURAL DESIGN:
Reinforced concrete, concrete technology, R.C.C. Design, working stress method and limit state method, Design of beams, Design of one-way and two-way slabs, design of axially loaded columns, design of continuous beams and slabs; Design of wall footings and isolated footings, combined footings, raft foundations, and retaining walls by limit state method, water tanks, Deck-slab and T-beam bridges by working stress method. Structural Steel – design of revetted and welded joints, design of tension members;

Compression members, simple and compound beams. Design of plate girders, crane girders and roof-trusses. Elements of pre-stressed concrete.

03. FLUID MECHANICS AND HYDRAULIC MACHINES:
Fluid properties; fluid static's; fluid-flow concepts; Laminar and turbulent flow; steady and unsteady-flow, uniform and non-uniform flow; Fundamental EQUATIONS; CONTINUITY EQUATION; Euler's equation of motion; Bernoulli's equation, Analysis of liquid jets; flow through orifies and mouth pieces; radial flow, flow along a curved path; Momentum equation and applications; Moment of Momentum equation. Dimensional analysis and similitude; Viscous flow-laminar flow through circular pipes; velocity distribution in laminar flow. Turbulent flow in pipes, velocity distribution in turbulent flow; Flow measurement – pressure moment, velocity measurement and discharge measurement, venturimeter, Orifice, meter, notches and weins. Hydraulic machines; Turbines and pumps; basic equations; Orifice, performance, selection, specific speed.

04. WATER RESOURCES ENGINEERING:
Steady flow through open channels. Uniform flow in channels; Chezy and Manning's formulae. Specific energy and critical depth. Hydraulic jump – Momentum equation for a hydraulic jump. Surface Water hydrology; Hydrologic cycle, hydrologic data- measurement of precipation, evaporation, transpiration, and infiltration. Runoff, determination of run-off. Steam gauging;

floor-Studies, Hydrograph and unit hydrograph, flood routing. Ground water resources, Darcy's law, Dupuits equation, yield of wells, recuperation test.

05. SURVEYING:
Chain surveying; compass surveying, plane table surveying; leveling and contouring, Minor instruments; Areas and Volumes; Theodolite surveying and traversing; Tachometry; Curve ranging; setting out works.

Principles and uses of triangulation, hydrographic surveying, Arial photogrammetry and photo interpretation, remote sensing and electromagnetic distance measurement.

06. GEO-TECHNICAL ENGINEERING:
Physical properties of soils; identification and classification of soils; permeability and seepage; consolidation; shearing strength of soil; stability of earth slopes; site investigation and sub soil exploration.

Stress distribution in soil; soil; compaction; lateral earth pressure and retaining walls; bearing capacity and shallow foundations; pile foundations; well foundations; Machine foundations.

07. TRANSPORTATION ENGINEERING:
Highway Engineering; classification of roads; highway alignment and surveys; geometric design of highways; elements of traffic engineering; highway materials and testing; elements of pavement design; construction and maintenance of earth gravel, W.B.M., bitumenous and concrete roads; highway drainage.

Railway Engineering; engineering surveys for a new railway route, gauge and gauge problem; track components; ballast; sleepers; rails anrail fastenings; Station and station yards;

requirements and requirement for station yards; signaling and inter locking. Elements of cross drainage works; causeways; culverts; bridges.

08 ENVIRONMENTAL ENGINEERING:

Water supply engineering; sources of water supply, conveyance of water, distribution systems; quality of water; treatment of water; filtration; dis-infection; methods of water treatment.

Sanitary engineering; sewerage and sewage disposal; house fittings; design of sewers; characteristics of sewage, primary and secondary treatment of sewage' methods of disposal of sewage.

4. MECHANICAL ENGINEERING

01. FLUID MECHANICS:
Fluid Properties, fluid static's, Kinematics and Dynamics, Euler's equation, sernoulli's energy equation, flow of ideal fluids, Viscous in compressible flows – laminar flow, boundary layer, basic features of turbulent flow, flow through pipes, fluid machinery, Specific speed and classification of fluid machines. Performance and operation of pumps, impulse and reaction turbines, velocity triangles and degree of reaction.

02. THERMO DYNAMICS:
Thermo dynamic systems, measurements of temperature work, heat and internal energy. First law of thermodynamics, ideal gas equation Air standard cycles, Carnot, Otto, Diesel, dual and joule cycle. Energy and Enthaipy. Second law of Thermo dynamics. Available and Unavailable energies.

Reversible and irriversible processes. Psychrometry, Properties of pure substances.

03. MATERIAL SCIENCE:
Structure of metal and alloys, Binding in solids. Imperfections of metals and in crystals, fracture, creep, fatigue and corrossion. Phase Rule, phase transformation diagrams and lever rule.

04. ENGINEERING MECHANICS AND STRENGTH OF MATERIALS:
Equivalent force systems, free body concepts and equations of equilibrium, frictional forces. Kinematics and dynamics of rigid bodies. Stress and strain, elastic limit, yield point and ultimate stress, shear force and bending moment diagrams for beams. Calculation of stress slope and deflection in beams, theories of failure, torsion of circular shaft, thin cylinders, equivalent bending moment for solid and hollow shafts.

05. MANUFACTURING PROCESSES:
Classification of manufacturing processes. Fundamentals of casting. Classification of casting process. Sandcasting – patterns, molding, melting and pouring solidification, cleaning and finishing casting defects. Metal forming – hot and cold working, forging, rolling extrusion, wire and tube drawing, deep drawing, blanking and stamping processes.

Fundamentals of welding arc and gas welding, brazing and soldering, heat treatment – appealing – normalizing, hardening and tempering.

06. APPLIED THERMO DYNAMICS:
Internal combustion engines classification, working and performance of C.I. and S.I. engines combustion process in I.C. Engines Rating of fuels, pre ignition and knocking in I.C. Engines, Carburation and injetion, Reciprocating air compressors – Single and ;multi stage compressors, inter cooling, volumetric efficiency.

Rotary Compressors – fans blowers and compressors Axial and Centrifugal compressors – merits and demerits.

Boilers and condensors – types of boilers and condensors, calculation of boiler efficiency and equivalent evaporation, feed water heaters.

Steam and Gas turbines Impulse and reaction turbines degree of reaction velocity triangles, ranking cycle for steam turbine power plant reheating and regeneration Gas turbine cycles methods of improving gas turbine cycle efficiency.

07. HEAT TRANSFER AND REFRIGERATION:
Modes of heat transfer, one dimensional steady and unsteady heat conduction convective heat transfer forced convection over flat plates and tubes, free convection over cylinders and flat plates radiative heat transfer-black and grey surfaces. Types of heat exchangers – heat exchanger performance LMTD and NTU methods vapor compression cycle analysis. COP; and its estimation vapor absorption refrigeration cycle properties of refrigerators.

08. MACHINE DESIGN:
Design for static and dynamic loading fatigue strength stress concentration, factor of safety designing of bolted, riveted and welded joints, hydro dynamic lubrication, journal and roller bearings design of spur and helical gears, clutches and breaks. Belt and rope drives Design of shafts, keys and couplings.

09. THEORY OF MACHINES:
Constrained motion, plane mechanisms, velocity acceleration analysis, Flywheel and their applications, Balancing of reciprocating and rotating masses cams and followers, Tooth profiles Types of gears Principles of

gyroscope, vibration of free and forced one degree of freedom systems with and without damping, critical speed of shaft.

10. PRODUCTION ENGINEERING:

Metal cutting and machining types of chips, chip formation tool wear and tool life, machine ability single point and multi point cutting operations machining processes shaping, planning, turning, milling, grinding, hobbling and drilling operating unconventional machining processes – USM, EDM, ECM and LBM. Basic features of NC Machines tools linear and angular measurements, Comparators, limit gauges, screw and gear measurements.

11. INDUSTRIAL ENGINEERING AND MANAGEMENT:

Industrial organisations and plant layout production planning and control cost of manufacturing. Break even analysis. Time and motion study, basic linear programming and queing theory. PERT / CPM in production systems.

5.COMPUTER ENGINEERING

01. Logic families, gates, flip-flops, Multiplexers, decoders, registers, counters, adder circuits, Boolean algebra, Combinational circuit design, minimisation, sequential circuit design, number systems, inter conversion, number representation, computer organisation, instruction formats, addressing modes, micro-programming, ALU organisation, multiplication and division algorithms, memory hierarchy, cache and associate memories, virtual memory, memory IC's, I/Oo organisation schemes, interrupts, arbitration, DMA, IOP, micro processors, interfacing, pipeline, SIMD and MIMD organisations, proposition and predicate logic's, methods of deduction, set theory, relations, functions, algebraic structures, lattices, recursion, combinatorics, graph theory, representation, path matrix, warshall's algorithm, cyclic and bipartite graphs, planner graphs, Hamiltonian graph, chromatic number, trees, binary tree traversals, representation of expressions, spanning trees, breadth-first and depth-first algorithms, finite automation, pushdown automation, Turing machine, grammars, type 0, 1, 2, and 3, LL and LR grammars.

02. Algorithms, flow-charts, programming methodology, data structures, PASCAL, FORTRAN, COBAL and 'C' languages, theory of programming languages, file organisation, searching and sorting; methods, DBMS, database models, query languages, operating system, directory concept, processor scheduling, memory allocation, paging and segmentation, device management, deadlocks and prevention, concurrent processing. DOS and UNIX features, language processors, syntax and semantic analysis, code generation, optimisation, assemblers, loaders and linkers, algorithm design techniques, Computer networks, digital modulation techniques, modems, error detection and error correction, BISYNC and HDLC protocols, OSI model, network routing algorithms, LAN operation methods, Computer graphics, DDA algorithms, graphic primities, 2-D transformations, graphic input devices, software engineering development life-cycle, system analysis, modular design, testing and validation, CASE tools, AI techniques, natural language understanding, learning, knowledge representation, expert systems, LISP, PROLOG.

6. a) COMMERCIAL AND COMPUTER PRACTICE

(To teach Commerce and English Type writing & Shorthand)

01. FINANCIAL MANAGEMENT:

Corporation Finance – Economic and Managerial Aspects –
Finance Education. Financial Plan – Operating and Financial
leverage – Capital Structure determinants.

Internal Financial Control – Ratio Analysis – Break-even Analysis – Sources and uses of funds statements.

Concepts of valuation and cost of capital – Cost of Debt - Cost of preference capital – Cost of Equity Capital – Cost of retained earnings – Weighted Cost of Capital.

Fundamentals of capital Budgeting – Evaluation of Investment opportunities – Pay back Accounting, Rate of Return – Discounted cash flow Techniques.

Concepts of over and under capitalisation – Working Capital management – Management of Inventories. Receivables and Cash.

Economics and Income retention – divided policy. Financial Aspects of expansion, reconstruction and recognition.

02. INDUSTRIAL ORGANISATION:
Concepts of Industry, Firm and Plant.

Size of Units – Optimum firm and representation firm – Size in Private and Public Sectors in India – Problems and Policy implications – Multi-Plant Units – Multi-Plant Units in Private and Public Sectors – Economic Problems and Policy Size and efficiency.

Location – Concepts of Location and Localisation – Location criteria – Factors influencing Localisation – Measures of Localisation – Localisation pattern in Indian Industry – Balanced Regional Development – Location development of managers – Performance Appraisal.

State and Industry – Operational Control over Private Industry.

03. LABOUR ECONOMICS AND INDUSTRIAL RELATIONS:
Labour in Industrial Society – Man Power Problems of under developed countries.

Economics of the Labour Market – Factors affecting supply and demand for labour – Concepts of full employment, unemployment – Different types of unemployment – Causes – effects and remedial measures, labour mobility – Absenteeism and turnover.

Social security and Labour Welfare – Problems of Social Security in a developing economy – Social Security in India. Settlement of Industrial Disputes – Machinery for the same.

Collective bargaining – Objectives and methods – Issues in Bargaining. Tripartite bodies in Industrial Relations.

04. MANAGEMENT:
Organisation Concept – Different approaches to the study of Organisation. Constraints over organisational and managerial Performance. Principles of Organisation.

Planning – Business Objectives – Social responsibilities of business. Authority, Power, Influence and the art of delegation. Span of Supervision. Line and Staff relationships.

Bases and problems of departmentation.
Centralisation and Decentralisation.

Bureaucracy – Committee Management.

Top management functions and the role of the Board. Control functions in organisations.

Group dynamics.
Communication – Leader ship – Motivation – Morale – Training and Development of Managers
– Performance appraisal.

6. b) COMMERCIAL AND COMPUTER PRACTICE

(To teach Computer Practice)

1. **Financial Management:** Meaning, nature, objectives and scope of financial management. Capital budgeting, process, techniques. Sources of finance. Cost of capital – cost of various sources of finances. Leverages – operating and financial leverages. Capital structure theories. Working capital management – cash, receivables and inventory management.

2. **Financial and management accounting:** Techniques of analysis of financial statements – comparative and common size statements, trend analysis and ratio analysis. Funds flow and cash flow analyses.

3. **Managerial Economics:** Meaning, nature and scope of managerial economics. Demand analysis. Production and cost analysis. Market structure – perfect and imperfect markets.

4. **Business environment:** Meaning and components of business environment. Industrial policies, and 1991. Liberalization privatization and globalization. WTO.

5. **Marketing management:** Meaning, concepts, nature and scope of marketing management – marketing environment. Consumer behaviour and market segmentation. Product, price, promotion and Channel management.

6. **Quantitative techniques:** Sampling and sampling methods. Probability and probability distributions – hypothesis testing. Parametric tests (Z, t – tests and ANOVA) and non-parametric tests (Chi – square tests).

7. **Business Mathematics :** Simple and Compound Interest, Calculating value of annuities, Functions and graphs, Limits and differentiation, Basic Matrix operations , Basics of Linear Programming.

8. **Computer tools for office applications:** Basic knowledge of computers and its peripheral equipment, Use of word processing (such as MS Word) and spreadsheet management (such as MS Excel) software. Use of internet and email for office correspondence. Use of accounting packages (such as Tally).

7.ENGLISH

I. Writers and Texts

1) William Shakespeare	Hamlet, Tempest
2) John Milton	Paradise Lost-Book 1 and 9
3) William Wordsworth	"Immortality Ode", Tintern Abbey
4) John Keats	"Ode to a Nightingale", "To Autumn"
5) Robert Browning	"My Last Duchess", "The Last Ride Together"
6) Charles Dickens	David Copperfield
7) TS Eliot	"The Waste Land", Murder in the Cathedral
8) GB Shaw	Saint Joan
9) Virginia Woolf	"A Room of One's Own"
10) Samuel Beckett	Waiting for Godot
11) William Golding	Lord of the Flies
12) Robert Frost	"Home Burial", "The Road Not Taken"
13) Eugene O'Neill	The Hairy Ape
14) Toni Morrison	Beloved
15) Mulk Raj Anand	Untouchable
16) AK Ramanujan	"Love Poem for a Wife", "Small-Scale Reflections on a Great House"
17) Girish Karnad	Hayavadana
18) Salman Rushdie	Midnight's Children
19) Chinua Achebe	Things Fall Apart
20) Margaret Atwood	Edible Woman
21) AD Hope	"Australia", "Crossing the Frontier"
22) Bessie Head	A Question of Power

II. English Language Teaching

1) ELT in India : (History and status of English in India; English as Second Language, English as Foreign Language, and English as Global Language).
2) Methods and Approaches : (Grammar Translation method, Direct method, Audio-Lingual method; Structural approach, Communicative language teaching)
3) Teaching of Language Skills : (Teaching of Listening, Speaking, Reading, and Writing Skills; Teaching of Grammar and Functional English; Teaching of Vocabulary; Classroom techniques; Use of authentic materials)
4) Testing and Evaluation : (Principles, Types, Objectives of testing and evaluation)
5) Phonetics and Phonology; Syntax and Structure.

8.MATHEMATICS

I. Real Analysis

Finite, countable and uncountable sets – Real Number system R – infimum and supremum of a subset of R – Bolzano – Weierstrass theorem.

Sequences, convergence, limit superior and limit inferior of sequences, sub sequences, Heine Borel Theorem.

Infinite series – Tests of convergence.

Continuity and uniform continuity of real valued functions of real variable. Monotonic functions and functions of bounded variation.

Differentiability and mean value theorems. Riemann integrability.

Sequences and Series of functions.

II. Metric Spaces

Metric spaces – completeness, compactness and connectedness – continuity and uniform continuity of functions from one metric space into another.

Topological spaces – base and subbase – continuous function.

III. Elementary Number Theory

Primes and composite numbers – Fundamental Theorem of arithmetic – divisibility – congruences – Fermat's theorem – Wilson's Theorem – Euler's - function.

IV. Group Theory

Groups, subgroups, normal subgroups – quotient groups – homomorphisms and isomorphism theorems – permutation groups, cyclic groups, Cayley's theorem. Sylow's theorems and their applications.

V. Ring Theory

Rings, integral domains, fields – subrings and ideals – Quotient rings – homomorphisms

– Prime ideals and maximal ideals – polynomial rings – Irreducibility of polynomials – Euclidean domains and principal ideal domains.

VI. Vector Spaces

Vector Spaces, Subspaces – Linear dependence and independence of vectors – basis and dimension – Quotient spaces – Inner product spaces – Orthonormal basis – Gram – Schmidt process.

VII. Matrix Theory

Linear transformations – Rank and nullity – change of bases.

Matrix of a linear transformation – singular and non-singular matrices – Inverse of matrix

– Eigenvalues and eigenvectors of matrix and of linear transformation – Cayley – Hamilton's theorem.

VIII. Complex Analysis

Algebra of complex numbers – the complex plane – Complex functions and their Analyticity – Cauchy-Riemann equations – Mobius transformations.

Power Series.

Complex Integration – Cauchy's theorem – Morera's Theorem – Cauchy's integral formula – Liouville's theorem – Maximum modules principle – Schwarz's lemma – Taylor's series – Laurents series.

Calculus of residues and evaluation of integrals.

IX. Ordinary Differential Equation

Ordinary Differential Equation (ODE) of first order and first degree – Different methods of solving them – Exact Differential equations and integrating factors.

ODE of first order and higher degree – equations solvable for p, x and y – Clairaut's equations – Singular Solutions.

Linear differential equations with constant coefficients and variable coefficients – variation of parameters.

X. Partial Differential Equations

Formation of differential equations (PDE) – Lagrange and Charpit methods for solving first order – PDE's – Cauchy problem for first order PDE's Classification of second order PDE's

General solution of higher order PDE's with constant coefficients.

9. PHARMACY

I.

i) History of Pharmacy: Code of ethics in Pharmacy, Posclogy; Principles of dispending of mixtures, emulsion, powers and suppositories; Different types of Incompatiabilities.

ii) Pharmacy Act; Drugs and Cosmetics Act and Rules; Drugs price control order including amendments.

iii) Methods of Sterilization and test for sterility; Preparation of vaccines, Sera and Antitoxins;

Manufacture of Penicillin and Streptomvcin.

iv) Methods of classification of crude drugs; Adulteration and evaluation of crude drugs.

v) Pharmacognosy of Senna, Digitalis, Ispaghula, Cinchona, Cinnamon, Renwolfia,

Podophyllu, Ergot Cod liver oil and Geletin.

vi) Principles, instrumentation and applications of colorimetry. Spectrophotonetry,

fluorimetry, gas chromatography and High performance liquid chromatography.

II.

i) Theory and applications of rheology (Newtonian and Non-Newtonian); Colloidal and

interfacial phenomenon and their applications; Coarse dispersion (emulsions and suspensions)

ii) Physics-Chemical, formulation and biological factors effecting drug absorption.

iii) Formulation, technology and qualify control of tablets, capsules, liquid crias, aercsols,

creams and cintments, injectables and sustained telease medicaments.

iv) Structure activity relationship, synthesis, chemical nomenclature and uses of following classes of drugs – dypnotics and Sedatives; trauqulizers; Analgesics and Autipyretics;

Anti-inflammatory drugs; Diuretics; anti-hypertensives and Chemotherapeutic Agents.

v) Pharmacology of Local anesthetics; Diuretics; Hormones; Hypeglyeemic agents; Antihistaminics;

Drugs acting on central pervious system; Adrenergic and Cholingrgic drugs and Cardio-vascular agents.

vi) Pharmacokinetic and Pharmacodynamic drug interactions with suitable examples;

Terratogenicity; Drug-induced diseases.

10 CHEMISTRY

INORGANIC CHEMISTRY

1. Atomic structure and chemical bonding – structure and bonding in homo and hetero nuclear molecules. Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules.

2. Transition elements and coordination compounds – physical and chemical characteristics of transition elements – Bonding theories – crystal field theory – crystal field splitting patterns in various geometries. Calculation of CFSE – Jahn - Teller effect – Application of MO theory to octahedral and square planar complexes – Electronic spectra of complexes – Russell Saunders

coupling – term symbols – spectra of octahedral and tetrahedral complexes – charge transfer spectra – magnetic properties of complex compounds.

3. Metal - ligand equilibria in solution – step wise and overall stability constants – factors affecting the stability of metal complexes – Pearson's theory of hard and soft acids and bases (HSAB) – Chelate effect.

4. Reaction mechanisms in complexes – Inert and level complexes – Ligand substitution reactions of octahedral complexes – Acid hydrolysis, base hydrolysis – conjugate base mechanism – Anation reactions – substitution reactions of square planar complexes – Trans effect – Electron transfer reactions – Inner and outer sphere mechanisms.

5. Metal complexes - EAN rule – structure and bonding of metal carbonyls of Mn, Fe, Co and Ni – Metal nitrosyls – structure and bonding.

6. Cages and ring compounds – preparation, structure and reactions of boranes and carboranes – Boron-nitrogen and Sulfur-nitrogen cyclic compounds.

7. Metal clusters – factors favoring M-M bonds – Structure and bonding in Re_2Cl^{2-}, $Mo_6Cl_8^{4+}$, $Nb_6Cl_{12}^{2+}$, Re_3Cl_9 and $Re_3Cl_{12}^{3-}$. 8

8. Bio-inorganic chemistry – metal complexes as oxygen carriers – hemoglobin and myoglobin – oxygen transport – non heme proteins – hemerythrin and hemocyanin.

9. Analytical chemistry – chromatography – general principles involved in separations by paper, thin layer and column chromatography – GC and HPLC.

Physical Chemistry

1. Thermodynamics

Brief review of concepts of I and II laws of thermodynamics. Concept of entropy. Entropy as a state function. Calculation of entropy changes in various processes. Entropy changes in an ideal gas. Entropy changes on mixing of ideal gases. Entropy as a function of V and T. Entropy as a function of P and T. Entropy change in isolated systems- Clausius inequality. Entropy change as criterion for spontaneity and equilibrium.

Third law of thermodynamics. Evaluation of absolute entropies from heat capacity data for solids, liquids and gases. Standard entropies and entropy changes of chemical reactions. Helmholtz and Gibbs free energies (A and G). A and G as a criteria for equilibrium and spontaneity. Physical significance of A and G. Driving force for chemical reactions- relative signs of ΔH and ΔS.

Thermodynamic relations. Gibbs equations. Maxwell relations. Temperature dependence of G. Gibbs- Helmholtz equation. Pressure dependence of G.

Chemical potential: Gibbs equations for non-equilibrium systems. Material equilibrium. Phase equilibium. Clapeyron equation and Clausius-Clapeyron equation .

Conditions for equilibrium in a closed system. Chemical potential of ideal gases. Ideal-gas reaction equlibrium-derivation of equilibrium constant. Temperature dependence of equilibrium constant-the van't Hoff equation.

Solutions: Specifiying the Solution composition. Partial molar poperties-significance. Relation between solution volume and partial molar volume. Measurement of partial molar volumes- slope and intercept methods. The chemical potential. Variation of chemical potential with T and

P. Gibbs-Duhem equation-derivation and significance

Ideal solutions. Thermodynamic properties of ideal solutions. Mixing quantities. Vapour pressure-Raoult's law. Thermodynamic properties of ideally dilute solutions. Vapour pressure- Henry's law.

Nonideal systems. Concept of fugacity, fugacity coefficeient. Determination of fugacity. Non ideal solutions. Activities and activity coefficients. Standard-state conventions for non ideal

solutions. Determination of activity coefficients from vapour pressure measurements. Activity coefficients of nonvolatile solutes using Gibbs-Duhem equation.

Multicomponent phase equilibrium: Vapour pressure lowering, freezing point depression and boiling point elevation

2. Statistical Thermodynamics

Concepts of distribution and probability. Estimation of probability and the most probable distribution. Systems composed of noninteracting particles. Derivation of Boltzmann distribution law.

The molecular partition function. Systems composed of interacting particles. The concept of ensemble and canonical ensemble. Canonical partition function and its relation to molecular partition function. The factorization of molecular partition function – translational, rotational, vibrational and electronic partition functions. Derivation of expressions for translational, rotational (diatomic) and vibrational partition functions. Relationship between partition functions and thermodynamic functions.

The relationship between partition functions and thermodynamic functions. Specific heats of solids – Einstein equation of heat capacity of solids – derivation. Explanation of heat capacity at very low and very high temperatures – Dulong and Petits Law. Debye theory.

The entropy of a monoatomic ideal gas. The Sackur-Tetrode equation-derivation. Mean translational and vibrational energies.

3. Electrochemistry

Electrochemical Cells : Derivation of Nernst equation – problems. Chemical and concentration cells (with and without transference). Liquid junction potential – derivation of the expression for LJP – its determination and elimination. Applications of EMF measurements : Solubility product, potentiometric titrations, determination of transport numbers, equilibrium constant measurements.

Decomposition potential and its significance. Electrode polarization – its causes and elimination. Concentration overpotential.

Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law (derivation not required). Calculation of mean ionic activity coefficient. Limitations of Debye-Huckel theory. Extended Debye-Huckel law.

Theory of electrolytic conductance. Derivation of Debye-Huckel-Onsager equation – its validity and limitations.

Concept of ion association – Bjerrum theory of ion association (elementary treatment) - ion association constant – Debye-Huckel-Bjerrum equation.

4. Quantum Chemistry

Black body radiation-Planck's concept of quantization-Planck's equation, average energy of an oscillator (derivation not required). Wave particle duality and uncertain principle-significance of these for microscopic entities. Emergence of quantum mechanics. Wave mechanics and Schroedinger wave equation.

Operator**s**-operator algebra. Commutation of operators, linear operators.Complex functions. Hermitian operators. Operators and ^{2} . Eigenfunctions and eigenvalues. Degeneracy. Linear combination of eigenfunctions of an operator. Well behaved functions. Normalized and orthogonal functions.

Postulates of quantum mechanics. Physical interpretation of wave function. Observables and operators. Measurability of operators. Average values of observables. The time dependent Schrodinger equation. Separation of variables and the time-independent Schrodinger equation.. **Theorems of quantum mechanics**. Real nature of the eigen values of a Hermitian operator-significance. Orthogonal nature of the eigen values of a Hermitian operator-significance of orthogonality. Expansion of a function in terms of eigenvalues. Eigen functions of commuting operators-significance. Simultaneous measurement of properties and the uncertainty principle. Particle in a box-one dimensional and three dimensional. Plots of and ^{2}- discussion. Degeneracy of energy levels. Comparison of classical and quantum mechanical particles. Calculations using wave functions of the particle in a box-orthoganality, measurability of energy, position and momentum, average values and probabilities. Application to the spectra of conjugated molecules.

Cartesian, Polar and spherical polar coordinates and their interrelations

Schrodinger equation for the hydrogen atom- separation into three equations. Hydrogen like wave functions. Radial and angular functions. Quantum numbers n, l and m and their importance. The radial distribution functions. Hydrogen like orbitals and their representation. Polar plots, contour plots and boundary diagrams.

Many electron systems. Approximate methods. The variation method-variation theorem and its proof. Trial variation function and variation integral. Examples of variational calculations. Paricle in a box. Construction of trial function by the method of linear combinations. Variation parameters. Secular equations and secular determinant.

Bonding in molecules. Molecular orbital theory-basic ideas. Construction of ^{2} MOs by LCAO , H^+ ion. The variationan integral for H^+ ion. Detailed calculation of Wave functions and energies for the bonding and antibonding MOs. Physical picture of bonding and antibonding wave functions. Energy diagram. The MO and VB wave functions for H_2 molecule and their comparision

5. Chemical Kinetics

Theories of reaction rates : Collision theory, steric factor. Tranition state theory. Reaction coordinate, activated complex and the transition state.

Thermodynamic formulation of transition state theory. Unimolecular reactions and Lindamann's theory.

Complex reactions- Opposing reactions, parallel reactions and consecutive reactions(all first order type). Chain reactions-general characteristics, steady state treatment. Example- H_2-Br_2 reaction. Derivation of rate law.

Effect of structure on reactivity- Linear free energy relationships. Hammett and Taft equations- substituent(and *) and reaction constant (and *)with examples.

Factors affecting reaction rates in solution. Diffusion controlledr eactions. Influence of dielectric constant and ionic strength on ion-ion, ion-dipole and dipole-dipole reactions. Primary and secondary salt effects. Kinetic isotope effects: Primary and secondary isotope effects. Solvent isotope effects.

Enzyme catalysis: Chemical catalysis and enzyme catalysis – distinction – energy considerations and rate accelerations – examples.

Michaelis-Menten mechanisms of enzyme catalyzed reactions involving one and two intermediates. Steady-sate approximation. Derivation of kinetic equations. Evaluation of kinetic parameters. Enzyme-substrate complex: Fischer's lock and key and Koshland's induced fit hypotheses. Specificity of enzyme-catalyzed reactions. Discussion of the various types of forces involved in the formation of E-S complex. pH dependence of enzyme-catalyzed reactions – the kinetics and the equations involved.

6. Photochemistry

Electronic transitions in molecules. The Franck Condon principle. Electronically excited molecules- singlet and triplet states. Radiative life times of excited states-theoretical treatment. Measured lifetimes. Quantum yield and its determination. Actinomety-ferrioxalate and uranyl oxalate actinometers-problems.

Derivation of fluorescence and phosphorescence quantum yields. E-type delayed fluorescence- evaluation of triplet energy splitting(ΔE_{ST}). Photophysical processes-photophysical kinetics of unimolecular reactions. Calculation of rate constants of various photophysical processes- problems, State diagrams

Photochemical primary processes. Types of photochemical reactions- electron transfer, photodissociation, addition, abstraction, oxidation and isomerization reactions with examples. Effect of light intensity on the rates of photochemical reactions. Photosensitization. Quenching- Stern Volmer equation. Experimental set up of a photochemical reaction. Introduction to fast reactions- Principle of flash photolysis

7. Solid state chemistry

Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para magnetism

Electronic properties of metals, insulators and semi conductors: Electronic structure of solids, Band theory, band structure of metals, insulators and semiconductors. Electrons, holes and Excitons. The temperature dependence of conductivity of extrinsic semi c̄onductors. Photo conductivity and photovoltaic effect-p-n junctions.

Superconductivity. Occurrence of superconductivity. Destruction of superconductivity by magnetic fields-Meisner effect. Types of superconductors. Theories of super conductivity- BCS theory.

ORGANIC CHEMISTRY

1) IUPAC nomenclature of organic molecules including structural, positional, functional, regio- and stereoisomers.

2) Molecular representations: Wedge, Fischer, Newman and Saw-horse formulae, their description and interconversions. Stereoisomers- classification-configuration –R,S- nomenclature- Criteria for Chirality. Axially chiral allenes, spiranes, alkylidene cycloalkanes, chiral biaryls, atropisomerism. Planar chiral ansa compounds and trans- cyclooctene. Helically chiral compounds, Determination of absolute configuration by chemical correlation methods. Determination of configuration in E,Z-nomenclature: Spectral and Chemical

   methods of configuration determination of E,Z isomers. Determination of configuration in aldoximes and ketoximes.

3) Nature of Bonding in Organic Molecules and Aromaticity, Delocalized chemical bonding- conjugation, cross conjugation, resonance, hyperconjugation, tautomerism, Huckle's rule and the concept of aromaticity, aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, metallocenes- Ferrocene, Azulenes, Fulvenes, Annulenes, anti-aromaticity, pseudo-aromaticity, homo-aromaticity.

4) Reactive intermediates and Molecular rearrangements. Reactive Intermediates: Generation, detection, structure, stability and reactions of carbocations, carbanions, carbenes, nitrenes and free radicals. Molecular rearrangements: Definition and classification. Molecular rearrangements involving 1) electron deficient carbon: Wagner- Meerwein, Pinacol-Pinacolone, Allylic and Wolf rearrangement. 2) electron deficient Nitrogen: Hofmann, Lossen, Curtius, Schmidt and Beckmann rearrangements 3) electron deficient Oxygen: Baeyer-Villiger oxidation. 4) Base catalyzed rearrangements: Benzilic acid, Favourski, Transannular, Sommlett-Hauser and Smiles rearrangement

5) Organic Reaction mechanism-I Electrophilic addition to carbon-carbon double bond: Stereoselective addition to carbon-carbon double bond; anti addition- Bromination and epoxidation followed by ring opening. Syn addition of OsO_4 and $KMnO_4$. Hydroboration. Michael reaction. Elimination reactions E2, E1, E1CB mechanisms. Orientation and stereoselectivity in E2 eliminations. Pyrolytic syn elimination and a-elimination, elimination Vs substitution. Determination of reaction mechanism: Energy profiles of addition and elimination reactions, transition states, product isolation and structure of intermediates, use of isotopes, chemical trapping, crossover experiments.

6) Importance of heterocyclic compounds as drugs. Nomenclature of heterocyclic systems based on ring size, number and nature of hetero atoms. Synthesis and reactivity of pyrrole, furan, thiophene, pyridine, indole, benzofuran, benzothiophene, quinoline, isoquinoline.
7) Alkaloids and terpenoids- Importance of natural products as drugs. Isolation of natural products by steam distillation, solvent extraction and chemical methods. Structure determination and synthesis of papaverine, nicotine and quinine-General methods in the structure determination of terpenes. Isoprene rule, structure determination and synthesis of a-terpeniol and camphor.

8) Organic Photochemistry, Photochemical energy, Frank-Condon principles, Jablonski diagram, singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum

yield. Photochemistry of carbonyl compounds - n* and * transitions. Norrish type-I and Norrish type-II cleavages. Paterno-Buchi reactions, Photoreduction, photochemistry of enones - hydrogen abstraction, rearrangements of ,- unsaturated ketones and cyclohexadienones, photochemistry of p-benzoquinones. Dienes - photochemistry of 1,3-butadienes, (2+2) additions leading to cage structures, photochemistry of cyclohexadienes, photochemistry of aromatic compounds, exicited state of benzene and its 1,2-, 1,4- additions

9) Pericyclic Reactions Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3 butadiene, 1,3,5 hexatriene and allyl system. Classification of pericyclic reactions. Woodward - Hoffmann correlation diagrams. FMO and PMO (Mobius Huckel) approaches. Electrocyclic reactions-Conrotatory and disrotatory. 4n, 4n+2 and allyl systems. Cycloadditions-antarafacial and suprafacial additions, 4n and 4n+2 systems, 2+2 addition of ketene, 1,3 dipolar cycloadditions Sigmatropic rearrangements - Suprafacial and antarafacial shifts of H, Sigmatropic shifts involving carbon moieties, 3,3 and 5,5 sigmatropic rearrangements.

10) Structure determination of organic compounds by UV IR, NMR an Mass Various electronic transitions, Beer-Lambert's law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl Compounds, dienes, conjugated polyenes, Effect of hydrogen bonding and solvent effects-NMR**-**Shielding mechanism, mechanism of measurement, chemical shift values, chemical exchange, complex spin-spin interaction, ^{13}C NMR spectroscopy, chemical shift-Mass spectral fragmentation of organic compounds, common functional groups, molecular-ion peak, metastable peak.

Annexure-II

INSTRUCTIONS TO CANDIDATES:

A) INSTRUCTIONS TO CANDIDATES:

- THE APPLICANTS ARE REQUIRED TO GO THROUGH THE USER GUIDE AND SATISFY THEMSELVES AS TO THEIR ELIGIBILITY FOR THIS RECRUITMENT CAREFULLY BEFORE APPLYING AND ENTER THE PARTICULARS COMPLETELY ONLINE.
- APPLICANT MUST COMPULSORILY FILL-UP ALL RELEVANT COLUMNS OF APPLICATION AND SUBMIT APPLICATION THROUGH WEBSITE ONLY. THE PARTICULARS MADE AVAILABLE IN THE WEBSITE WILL BE PROCESSED THROUGH COMPUTER AND THE ELIGIBILITY DECIDED IN TERMS OF NOTIFICATION AND CONFIRMED ACCORDINGLY.
- THE APPLICATIONS RECEIVED ONLINE IN THE PRESCRIBED PROFORMA AVAILABLE IN THE WEBSITE AND WITHIN THE TIME SHALL ONLY BE CONSIDERED AND THE COMMISSION WILL NOT BE HELD RESPONSIBLE FOR ANY KIND OF DELAY/DISCREPANCY ON PART OF THE CANDIDATE.
- APPLICANTS MUST COMPULSORILY UPLOAD HIS/HER OWN SCANNED PHOTO AND SIGNATURE THROUGH J.P.G FORMAT.
- THE APPLICANTS SHOULD NOT FURNISH ANY PARTICULARS THAT ARE FALSE, TAMPERED, FABRICATED OR SUPPRESS ANY MATERIAL INFORMATION WHILE MAKING AN APPLICATION THROUGH WEBSITE.
- IMPORTANT:- HAND WRITTEN/TYPED/PHOTOSTAT COPIES/PRINTED APPLICATION FORM WILL NOT BE ENTERTAINED.

B) INSTRUCTIONS REGARDING ON-LINE EXAMINATION FOR CANDIDATES:

1) The candidates should take their seats at the prescribed time before the commencement of the examination. Biometric identification would be conducted before entry into examination hall. The entry time would be mentioned in the hall ticket. Late entry after the given entry time would not be allowed. Candidates should not leave the examination hall till the expiry of fulltime. Loaning and interchanging of articles among the candidates is not permitted in the examination hall. Electronic devices including cell phones and pagers are not allowed in the examination hall. Non programmable calculators would be permitted, wherever necessary.

2) The starting time of each examination paper and the entry time would be mentioned in the hall ticket

3) Candidates will not be permitted to leave the examination hall till the expiry of full time. If any candidate leaves the examination hall in the middle, he would be disqualified. If there is any problem with computer system, the candidates have to wait without talking to others till the system is restored. In case of any violation, the candidate will be disqualified.

4) The examination link with the login screen will already be available on your system. Please inform the invigilator if this is not the case.

5) 10 minutes prior to the exam, you'll be prompted to login. Please type the Login ID (Roll No) and the Password (Password for Candidate will be given on exam day) to proceed further.

6) Invigilator will announce the password 15 minutes before commencement of the Examination.

7) Copying or noting down questions and/or options is not allowed. Severe action will be taken if any candidate is found noting down the questions and/or options.

8) After logging in, your screen will display:

**Profile Information - Check the details & click on "I Confirm" or "I Deny".*

**Detailed exam instructions - Please read and understand thoroughly.*

**Please click on the "I am ready to Begin" button, after reading the instructions.*

9) You have to use the mouse to answer the multiple choice type questions with FOUR alternative answers.

10) To answer any numerical answer type question, you need to use the virtual numeric key pad and the mouse.

11) On the online exam question screen, the timer will display the balance time remaining for the completion of exam.

12) The question numbers are color coordinated and of different shapes based on the process of recording your response: White (Square) - For un-attempted questions. Red (Inverted Pentagon) - For unanswered questions. Green (Pentagon) - For attempted questions. Violet (Circle) - Question marked by candidate for review, to be answered later. Violet (Circle with a Tick mark) - Question answered and marked by candidate for review.
13) After answering a question, click the SAVE & NEXT button to save your response and move onto the next question.

14) Click on Mark for Review & NEXT to mark your question for review, and then go to the next question.

15) To clear any answer chosen for a particular question, please click on the CLEAR RESPONSE button.

16) A summary of each section, (i.e. questions answered, not answered, marked for review) is available for each section. You have to place the cursor over the section name for this summary.

17) In case you wish to view a larger font size, please inform the Invigilator. On the Invigilator's confirmation, click on the font size you wish to select. The font size will be visible on the top.

18) You may view INSTRUCTIONS at any point of time during exam, by clicking on the INSTRUCTIONS button on your screen.

19) The SUBMIT button will be activated after 150 Minutes. Please keep checking the timer on your screen.

20) In case of automatic or manual log out, all your attempted responses will be saved. Also, the exam will start from the time where it had stopped.

21) You will be provided a blank sheet for rough work. Do write your Login ID and Password on it. Please ensure that you return it to the invigilator at the end of the exam after tearing only the password from it.

22) Please don't touch the key board as your exam ID will get locked. If your ID gets locked, please inform a nearby invigilator who will help in unlocking your ID and then you can continue with the exam.

23) Please inform the invigilator in case of any technical issues.

24) Please do not talk to or disturb other candidates.

25) In case you are carrying articles other than the admit card, photo identity proof and pen, please leave them outside the exam room.

26) You cannot leave exam room before submitting the paper. Please inform the invigilator if you want to use the wash room.

C*) GENERAL INSTRUCTIONS TO CANDIDATES:*

1) If the candidate notices any discrepancy printed on the Hall ticket, as to community, date of birth etc., he/she may immediately bring it to the notice of Commission's officials/Chief Superintendent in the examination centre and necessary corrections can be made in the Nominal Roll, in the Examination Hall against his/her Hall Ticket Number for being verified by the Commission's Office.

2) The candidate should satisfy the Invigilator of his/her identity with reference to the signature and photographs available on the Nominal Rolls and Hall Ticket.

3) The candidates should take their seats at the given time before the commencement of the examination and are not to be allowed after the scheduled time. The time of Examination and entry time would be mentioned in the hall ticket. Late entry after the given entry time would not be allowed. Candidates should not leave the examination hall till the expiry of fulltime.

4) The candidates must note that his/her admission to the examination is strictly provisional. The mere fact that an Admission to the examination does not imply that his/her candidature has been finally cleared by the Commission or that the entries made by the candidate in his/her

application have been accepted by the Commission as true and correct. The candidates have to be found suitable after verification of original certificates; and other eligibility criteria. The Applicants have to upload his/her scanned recent colour passport photo and signature to the Application Form. Failure to produce the same photograph, if required, at the time of interview/ verification, may lead to disqualification. Hence the candidates are advised not to change their appearance till the examination process is complete.

5) The candidates are not allowed to bring any Electronic devices such as mobile / cellphones, programmable calculators, tablets, iPad, Bluetooth, pagers, watches or any other computing devices to examination Hall. Non programmable calculators would be permitted, wherever necessary. Loaning and interchanging of articles among the candidates is not permitted in the examination hall and any form of malpractice will not be permitted in the exam hall.

6) The candidates are expected to behave in orderly and disciplined manner while writing the examination. Their candidature will be rejected in case of impersonation/ disorder/ rowdy behaviour during Examination and necessary F.I.R. for this incident will be lodged with concerned Police Station. The Chief Superintendent of the centre is authorized to take spot decision in this matter.

7) Candidates trying to use unfair means shall be disqualified from the selection. No correspondence whatsoever will be entertained from the candidates.

8) The Penal Provisions of Act 25/97 published in the A.P. Gazette No. 35, Part-IV.B Extraordinary dated: 21/08/1997 shall be invoked if malpractice and unfair means are noticed at any stage of the Examination. Action will be taken to penalize as per G.O.Ms.No.385, G.A. (Ser. A) Dept., Dt.18/10/2016.

9). (a) Wherever the candidates are totally blind, they will be provided a scribe to write the examination and 20 minutes extra time is permitted to them per hour. Eligible candidates are also allowed to bring their own scribe after due intimation to the Commission after duly providing the full identification details of the scribe like name, address and appropriate proof of identification.

(b) The applicants shall upload the certificate relating to percentage of disability for considering the appointment of scribe in the examination.

(c) An extra time of 20 minutes per hour is also permitted for the candidates with locomotor disability and CEREBRAL PALSY where dominant (writing) extremity is affected for the extent slowing the performance of function (Minimum of 40% impairment). No scribe is allowed to such candidates.

(d) The candidate as well as the scribe will have to give a suitable undertaking conforming to the rules applicable

10). In case the Hall-Ticket is without photo or too small, he/she should affix a passport size photo on Hall-ticket and appear by duly getting attested by Gazetted Officer. He/she shall handover similar photo for each paper to Chief Superintendent for affixing the same on the Nominal Rolls.

11) The candidate will not be admitted to the examination Hall without procedural formalities.

12) The candidate admission to the Examination is provisional, subject to the eligibility, confirmation/satisfaction of conditions laid down in this notification.

13) The candidates should put his/ her signature and get the signature of the invigilator at the appropriate places in the Nominal Roll.

14) Instructions to be followed scrupulously in the Examination Hall.