KAKATIYA UNIVERSITY
U.G. Skill Enhancement Course - IV
(Under CBCS)
B.Sc. Final Year
SEMESTER - VI
(FOR ALL SCIENCE FACULTY DEPARTMENTS)

QUANTITATIVE APTITUDE TEST

Credits: 2

Theory: 2 hours/week **Marks - 40**

Unit – I ARITHMETICAL ABILITY

1.1 Arithmetical Ability: Ratio & Proportion
1.2 Arithmetical Ability: Time & Work, Time & Distance
1.3 Arithmetical Ability: Simple Interest, Compound Interest
1.4 Arithmetical Ability: Stocks & Shares

Unit – II DATA INTERPRETATION

2.1 Data Interpretation: Tabulation
2.2 **Data Interpretation**: Bar Graphs
2.3 **Data Interpretation**: Pie Charts
2.4 **Data Interpretation**: Line Graphs

Text Book: Quantitative Aptitude by Dr. R.S.Aggarwal

KAKATIYA UNIVERSITY
U.G. B.Sc. Final Year (Under CBCS)
Semester – VI: Generic Elective Paper-II
(FOR ALL SCIENCE FACULTY DEPARTMENTS)

WATER RESOURCES MANAGEMENT

UNIT-I

1. Importance of Natural Resources – Different Types Resources
2. Significance of Water Resources and their uses
3. Conservation of water and recycling of the water – Global distribution of water
4. Water shed programmes and their management
5. Storing the rain water in tanks and recharging ground water.

Unit-II

6. Rain water harvesting in rural areas (chekdam, trenches etc.,)
7. Over use of surface and ground water and control measures.
8. Aims, objectives and implementation of Mission Bhagiratha (Telangana Government Drinking water programme)
9. Aims, objectives and implementation of Mission Kakatiya (Telangana Government minor irrigation programme)
10. Issues and challenges in Water Resources Management

B.Sc. (Physics)- III Year

Semester – VI

Paper – VII:: Modern Physics

(DSC – Compulsory)

(w.e.f the academic year 2018-2019)

42 hrs
(3 hrs / week)

UNIT-I (11 hrs)

Atomic Spectra and Models - Inadequacy of classical physics:

Brief review of black body radiation , Photoelectric effect, Compton effect, dual nature of radiation, wave nature of particles. Atomic spectra, Line spectra of hydrogen atom, Ritz -Rydberg combination principle. Alpha particle scattering, Rutherford scattering formula, Rutherford model of atom and its limitations, Bohr‟s model of hydrogen atom, explanation of atomic spectra, correction for finite mass of the nucleus, Bohr correspondence principle, limitations of Bohr model, discrete energy exchange by atom, Frank Hertz experiment. Sommerfeld's modification of Bohr‟s theory.

UNIT-II (11 hrs)

Wave particle duality, de-Broglie hypothesis, Experimental confirmation of matter wave, Davisson-Germer experiment, velocity of de-Broglie wave, wave particle duality, Complementarity. Superposition of two waves, phase velocity and group velocity, wave packets, Gaussian wave packet, spatial distribution of wave packet, Localization of wave packet in time. Time development of a wave Packet; Heisenberg uncertainty Principle, Illustration of the principle through thought experiments of Gamma ray microscope and electron diffraction through a slit. Time-independent Schroedinger wave equation and its application to linear harmonic oscillator.

UNIT-III (9 hrs)

Nuclear physics: Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, Liquid-drop model: semi-empirical mass formula and binding energy, Nuclear shell model and magic numbers.

Unit IV(11 hrs)

Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus. Fission and fusion - Mass defect, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussion).

Text Books:

1. Introduction to Atomic spectra – H. E. White, McGraw-Hill
2. Nuclear Physics – D. C. Tayal, Himalaya Publishing House
3. Quantum Theory and Nuclear Physics – V. K. Srivastava, ABD Publisher, Jaipur
4. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
5. Modern Physics ---Murugesan and Sivaprasad –(S. Chand Higher Academics)

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6. Introduction to Modern Physics, Rich Meyer, Kennard, Coop, 2002, Tata McGraw Hill
7. Introduction to Quantum Mechanics, David J. Griffith, 2005, Pearson Education.
8. Physics for scientists and Engineers with Modern Physics, Jewett and Serway, 2010, Cengage Learning.
9. Quantum Mechanics: Theory & Applications, A. K. Ghatak & S. Lokanathan, 2004, Macmillan

Reference Books

1. Modern Physics – Bernstein, Fishbane and Gasiorowicz (Pearson India) 2010
2. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles -- R. Eisberg (Wiley India) 2012 Additional Books for Reference
3. Modern Physics, J.R. Taylor, C.D. Zafiratos, M.A. Dubson, 2004, PHI Learning.
4. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub.
5. Six Ideas that Shaped Physics: Particle Behave like Waves, T.A.Moore, 2003, McGraw Hill
6. Modern Physics-Serway (CENGAGE Learnings) 2014

B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VII: Modern Physics Lab

1. Measurement of Planck‟s constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck‟s constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of e/m for electron by long solenoid method.
13. Photo Cell – Determination of Planck‟s constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg‟s constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash& Ramakrishna, 11th Edn, 2011,Kitab Mahal

Note: Minimum of eight experiments should be performed.

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B.Sc. (Physics)- III Year

Semester – VI

Paper – VIII(A):: Basic Electronics

(DSE– Elective-1)

42 hrs
(3 hrs / week)

Unit-I: (10 Hrs)

Network Elements and Network Theorems

Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin‟s theorem, Norton‟s theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Two-port Networks – Introduction - Z-parameters, Y-parameters, h-parameters and ABCD-parameters (Simple problems).

Unit – II: (10 Hrs)

Band theory of P-N junction

1. Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in solids, insulators, semi conductors and pure or intrinsic semiconductors and impure or extrinsic semi-conductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation.

2. Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

Unit-III: (11 Hrs)

1. Bipolar Junction Transistor (BJT) – p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configurations – transistor as an amplifier - RC coupled amplifier – Frequency response (Qualitative analysis).

2. Feedback concept & Oscillators: Feedback, General theory of feedback – Concepts of oscillators, Barkhausen‟s criteria, Phase shift oscillator – Expression for frequency of oscillation.

Unit-IV: (11 Hrs)

1. Digital Electronics

Binary number system, convertion of binary to decimal and vice-versa. Binary addition and subtraction (1‟s and 2‟s complement methods). Hexadecimal number system. Conversion from binary to hexadecimal and vice-versa, Decimal to hexadecimal and vice-versa.

2. Logic gates:

OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate (EX-OR). De Morgan‟s Laws – Statement and proof.

NOTE: Problems should be solved from every chapter of all units.

Textbooks

1. Electronic devices and circuits – Millman and Halkias. *Mc.Graw-Hill Education.*
2. Principles of Electronics by V.K. Mehta – *S. Chand & Co.*
3. Basic Electronics (Solid state) – B. L. Theraja , S. Chand & Co.

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4. A First Course in Electronics- Anwar A. Khan&Kanchan K. Dey, PHI.

Reference Books

1. Basic Electronics – BernodGrob.
2. Third year Electronics – Telugu Academy
3. Digital Principles & Applications – A.P. Malvino and D.P. Leach
4. Circuit theory- Umesh.

B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VIII(A): Basic Electronics Lab

1. AND, OR, NOT, gates – Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. NAND and NOR gates truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan‟s Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

❖ Every student should complete minimum 06 experiments.

Text Books for LAB (Practical 6)

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, PragathiPrakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

Note: Minimum of eight experiments should be performed.

B.Sc. (Physics)- III Year

Semester – VI

Paper – VIII (B):: Physics of Semiconductor Devices

(DSE – Elective-2)

42 hrs
(3 hrs / week)

Unit-I: (11 hrs)

Semiconductor Physics: Conductors, semiconductors, forbidden gap, energy levels, crystals and covalent bonds, free electrons and holes, recombination and life-time, energy bands. Intrinsic semiconductor - intrinsic carrier concentration, density of electrons in conduction band, Fermi-level, Mass action law. Carrier transport phenomena - mobility, resistivity, diffusivity, Einstein‟s relation, current density equation. Extrinsic semiconductor - n-type semiconductor, p-type semiconductor, energy band diagram of extrinsic semiconductor. Hall effect- mobility and Hall angle, experiment arrangement for the study of Hall effect, significance of Hall effect.

Unit – II: (11 hrs)

P-N junction - Depletion layer, Energy level diagram of p-n junction, Band structure of an open circuited p-n junction, Biasing of p-n junction, effect of barrier potential on forward bias, reverse leakage current, reverse breakdown, p-n junction under various conditions - thermal equilibrium, forward and reverse bias, current-voltage characteristics. Derivation of ideal diode equation of p-n junction, diode model and its approximations. Forward and reverse resistance of diode. Dynamic characteristic of diode.

Unit-III: (10 hrs)

Special diodes **–** Construction and characteristics of Zener diode, Light emitting diode (LED), Photo-diode, Schottky diode, Backward diodes and Tunnel diode.

Transistors - Bipolar junction transistor (BJT), transistor characteristics, transistor equation in active region, Field effect transistor (FET), MOSFET and photo transistor.

Unit-IV: (10 hrs)

Control devices- Shockley diode, Silicon controlled rectifier (SCR), Silicon controlled switch (SCS), Unijunction transistor (UJT), Solar cells, Opto-couplers.

Textbooks

1. A First Course in Electronics- Anwar A. Khan&Kanchan K. Dey, PHI
2. Physics of Semiconductor Devices- S. M. Sze
3. Physics of Semiconductors- Streetman.

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B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VIII (B): Physics of Semiconductor Devices Lab

1. Characteristics of a Transistor in CE configuration
2. Zener diode V-I characteristics.
3. P-n junction diode V- I characteristics.
4. Zener diode as a voltage regulator
5. Determination of carrier concentration using Hall effect
6. Thermistor characteristics
7. Efficiency of a LED
8. Solar cell: fill factor and efficiency
9. FET characteristics
10. SCR characteristics
11. UJT characteristics

❖ Every student should complete minimum 06 experiments.

Text Books:

1. Basic electronics - Grob
2. Practical Electronics – Zbar

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B.Sc. (Physics) – III year
Semester – VI
(DSE – Elective-3)
Paper: VIII (C): ELECTRONIC INSTRUMENTATION

42 hrs
(3 hrs / week)

Unit- I (10 hrs)

Qualities of Measurement: Specifications of instruments, their static and dynamic characteristics, errors in measurement, types of static error, sources of error, dynamic characteristics and statistical analysis.

Basic Measurement Instruments: DC measurement: dc voltmeter, ohmmeter and ammeter. Digital type voltmeter, Ammeter and ohmmeter, Digital multimeter.

Unit –II (10 hrs)

AC measurement: AC voltmeter & ammeter.

Digital frequency meter: Elements of frequency meter, universal counter and its different modes, measurement errors and extending the frequency range. Digital LCR-Q meter, digital wattmeter.

Unit-III (11 hrs)

Signal Generators: Types of generators and their operation: Audio oscillator, Function generators, Pulse generators, RF generators.

Electronic Displays: The Cathode Ray Oscilloscope (CRO): Block diagram of a General Purpose Oscilloscope and its basic operation, electrostatic focusing and deflection, screen for CRT, CRT connections, CRO probes.

Unit –IV (11 hrs)

Transducers: Various types of transducers for measurement of displacement, speed, stress and strain. Classification and selection of transducers. Strain Gages: bonded and un-bonded strain gages, strain gage transducer sensitivity. Position Transducer: capacitive, inductive, linear variable differential transformer (LVDT), Piezoelectric, potentiometer. Temperature transducers: Resistance thermometers, thermocouples, thermistor and semiconductor p-n junction transducer.

TEXT BOOKS:

1. H. S. Kalsi, Electronic Instrumentation, Tata McGraw Hill (2006)
2. Joseph J Carr, Elements of electronic instrumentation and measurement, Pearson Education (2005)
3. C. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata McGraw Hill (1998)
4. H. Cooper, Modern electronic instrumentation and measurement techniques, Pearson Education
   (2005)
5. R. A. Witte, Electronic test instruments: analog and digital measurements, Tata McGraw Hill (2004)
6. S. Wolf and R. F. M. Smith, Student Reference Manual for Electronic Instrumentation Laboratories, Pearson Education (2004)

REFERENCES:

1. Electrical Measurement in Measuring Instruments. Goldwing E.W. and Widdies
2. Electrical and Electronics Measurement and Instrumentation Sahwany A.K.
3. Instrumentation devices and systems: Rangan, Sarma, Mani, TMH
4. Instrumentation measurement and analysis: Nakra B C, Chaudry K K, TMH
5. Handbook of biomedical instrumentation: Khandpur R S, TMH
6. Measurement systems applications and design: Doeblin E O, McGraw Hill, 1990.
7. Electron measurements and instrumentation techniques: Cooper W D and Helfric AD,PHI,1989.

B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VIII (C): ELECTRONIC INSTRUMENTATION LAB

1. Design of multi range ammeter and voltmeter using galvanometer.
2. To determine the Characteristics of resistance transducer - Strain Gauge
3. Measurement of Strain using half and full bridge
4. To determine the Characteristics of LVDT.
5. To determine the Characteristics of RTD.
6. Measurement of temperature by Thermocouples and study of transducers like AD 590
7. Two terminal temperature sensor PT-100, J- type, K-type.
8. Measurement of temperature using thermistor
9. Calibration of resistance thermometer
10. Frequency response of series LCR circuit

- Every student should complete minimum 06 experiments.