KAKATIYA UNIVERSITY

B.Sc. Final Year (Under CBCS)

SEMESTER – V

(SEC-3) Skill Enhancement Course-III

(FOR ALL SCIENCE FACULTY DEPARTMENTS)

VERBAL REASONING FOR APTITUDE TEST

Credits: 2

Theory: 2 hours/week **Marks - 50**

Unit – I NUMBERS AND DIAGRAMS

1.1 Series Completion: Number series, Alphabet Series

1.2 Series Completion: Alpha Numeric Series, Continuous Pattern Series

1.3 Logical Venn Diagrams

1.4 Mathematical Operations: Problem solving by substitution, Interchange of signs and numbers

Unit – II ARITHMETICAL REASONING

2.1 Mathematical Operations: Deriving the appropriate conclusions

2.2 Arithmetical Reasoning: Calculation based problems, Data based problems

2.3 **Arithmetical Reasoning**: Problems on ages, Venn diagram based problems

2.4 Cause and Effect Reasoning

Text Book: A Modern Approach to Verbal & Non-Verbal Reasoning by Dr. R.S.Aggarwal

KAKATIYA UNIVERSITY
B.Sc. Final Year (Under CBCS)
SEMESTER – V
(GE-1) GENERIC ELECTIVE-I
(FOR ALL SCIENCE FACULTY DEPARTMENTS)

PUBLIC HEALTH AND HYGIENE

Credits: 2

Theory :2 hours/week **Marks: 50**

UNIT – I : NUTRITION AND ENVIRONMENT

1.1 Balanced diet and Malnutrition.

1.2 Nutritional deficiencies and disorders- Carbohydrates, proteins, lipids, vitamins and minerals.

1.3 Occupational, Industrial, agricultural and urban Health-Exposure at work place, urban areas, industrial workers, farmers and agricultural labourers, Health workers and health disorders and diseases.

1.4 Environmental pollution and associated Health hazards, Water borne diseases and Air borne diseases.

UNIT-II : DISEASES AND HEALTH CARE

2.1 Causes, Symptoms, Diagnosis, Treatment and Prevention - Malaria, Filaria, Measles, Polio, Chicken pox, Rabies, Plague, Leprosy,.

2.2 Causes, Symptoms, Diagnosis, Treatment and Prevention of non communicable diseases - Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health.

2.3 Health care legislation in India – Termination of pregnancy act, Maternity benefit act, Biomedical waste act, ESI act.

2.4 First Aid and Health awareness, personal health care record maintenance.

KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSC-1E)

SEMESTER – V

Paper – V: Electromagnetism

Unit I : Electrostatics (11 hrs)

Electric Field:- Concept of electric field lines and electric flux, Gauss‟s law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field „E‟, Irrotational field. Electric potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Unit II : Magnetostatics (12 hrs)

Concept of magnetic field „B‟ and magnetic flux, Biot-Savart‟s law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere‟s law, Applications of Ampere‟s law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Unit III: Electromagnetic Induction (9 hrs)

Faraday‟s laws of induction (differential and integral form), Lenz‟s law, self and mutual Induction. Continuity equation, modification of Ampere‟s law, displacement current, Maxwell equations

Unit IV : Electromagnetic waves (10 hrs)

Maxwell‟s equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, polarization, reflection and transmission. Polarization of EM waves, Brewster‟s angle, description of linear, circular and elliptical polarization.

Text Books

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)
2. Electricity and magnetism by J.H.Fewkes& John Yarwood. Vol.I (Oxford Univ. Press, 1991).
3. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings,1998).

Reference Books

1. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
2. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)
3. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl

Date: 24th Aug., 2016 & 5th June, 2017

KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSC-1E)

SEMESTER – V

Paper – V:: Electromagnetism Lab

PHYSICS LABORATORY

1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster‟s bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty‟s bridge.
9. To determine self-inductance of a coil by Anderson‟s bridge using AC.
10. To determine self-inductance of a coil by Rayleigh‟s method.
11. To determine coefficient of Mutual inductance by absolute method.

Note: Minimum of eight experiments should be performed.

Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books for Reference:

1. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
2. InduPrakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal

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KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper – VI (A):: Solid State Physics
(Elective-1)

Unit-I (11 hrs)

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis, Crystal systems, Bravais lattices, Unit Cell, Miller Indices. Types of Lattices, Reciprocal Lattice. Packing factors: SC, BCC, FCC, HCP, Brillouin Zones. Diffraction of X-rays by Crystals.

Bragg‟s Law.

Elementary Lattice Dynamics: Lattice vibrations and phonons, Linear monoatomic and diatomic chains. Acoustical and optical phonons. Qualitative description of the phonon spectrum in solids. Dulong and Petit‟s Law, Einstein and Debye theories of specific heat of solids. T^3 law.

Unit-II (11 hrs)

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin theory of dia- and paramagnetism. Curie‟s law, Weiss‟s theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

Dielectric Properties of Materials: Polarization. Local electric field at an atom. Depolarization field. Electric susceptibility. Polarizability. Clausius-Mosotti Equation. Classical theory of electric polarizability.

Unit-III (10 hrs)

Elementary band theory: Kronig Penny model. Band Gap. Brillouin zones, effective mass of electron. Classification of materials based on band theory: conductor, semiconductor and insulator. Conductivity of Semiconductor, mobility, Hall Effect. Measurement of conductivity (04 probe method) & Hall coefficient.

UNIT IV (10 hrs)

Lasers: Einstein‟s A and B coefficients. Metastable states. Spontaneous and Stimulated emissions.

Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Ruby Laser and He-Ne Laser.

Superconductivity: Introduction, Critical temperature, Critical magnetic field, Meissner effect, Type I and type II superconductors, London‟s equation and penetration depth, Isotope effect, concept of BCS theory

Text Books:

1. Introduction to Solid State Physics, Charles Kittel, 8th Edition, 2004, Wiley India Pvt. Ltd.
2. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India
3. Solid State Physics, M.A. Wahab, 2011, Narosa Publications
4. Solid State Physics – S. O. Pillai (New Age Publication)
5. LASERS: Fundamentals and Applications – Thyagarajan and Ghatak (McMillanIndia)

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Reference Books:

1. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer
2. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
3. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
4. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning
5. Solid State Physics- R.K.Puri&V.K. Babbar (S.Chand Publication)2013
6. Lasers and Non linear Optics –B.B.Laud-Wiley Eastern.

KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: VI (A) Solid State Physics Lab

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids (Guoy‟s method)
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To study the polarization-electric field (P-E) hysteresis loop of a Ferroelectric Crystal.
6. To draw the B-H curve of Fe using Solenoid & determine energy loss from Hysteresis.
7. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 ^{o}C) and to determine its band gap.
8. To determine the Hall coefficient of a semiconductor sample.
9. Calculation of d-values of a given Laue‟s pattern.
10. Calculation of d-values of power diffraction method.
12. To study the spectral characteristics of a Photo- Voltaic cell.
13. . Verification of Bragg‟s equation.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, KitabMahal
4. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

Note: Minimum of eight experiments should be performed.

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U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper – VI (B):: Modern Optics
(Elective-2)

Unit I (11 hrs)

Principles of Lasers: Emission and absorption of radiation – Einstein relations. - Pumping mechanisms – Optical feedback - Laser rate equations for two, three and four level lasers. Pumping threshold conditions – Properties of Laser beams. Classification of laser systems – Gas, Liquid and Solid Lasers: He-Ne, and Argon lasers, their energy level schemes – Ruby laser and Nd:YAG laser, Ga-As laser, and their applications in various fields.

Unit II (11 hrs)

Holography: Basic principles of holography- Recording of amplitude and phase- The recording medium- Reconstruction of original wave front- Image formation by wave front reconstruction- Gaber hologram- Limitations of Gaber hologram - Off axis hologram - Fourier transform holograms - Volume holograms, Applications of holograms.

Unit III (10 hrs)

Fourier and Non-Linear Optics: Fourier optics - Thin lens as phase transformation – Thickness function- Various types of lenses- Fourier transforming properties of lenses – Object placed in front of the lens- Object placed behind the lens.

Non-Linear Optics: Harmonic generation- second harmonic generation- phase matching condition- Optical mixing- Parametric generation of light – Self focusing of light.

Unit IV (10 hrs)

Optical Fibers: Fiber types and their structures. Ray optics representation, acceptance angle and numerical aperture. Step index and graded index fibers, single mode and multimode fibers. Fiber materials for glass fibers and plastic fibers. Signal attenuation in optical fibers: Absorption, scattering and bending losses in fibers, core and cladding losses. Material dispersion, wave guide dispersion, inter-mode distortion and pulse broadening.

Recommended Books:

1. Opto Electronics- An Introduction – Wilson & JFB Hawkes 2nd Edition.
2. Introduction to Fourier optics – J.W. Goodman
3. Lasers and Non-Linear optics – B.B. Laud
4. Optical Electronics – Ghataknd ThygaRajan.
5. Principles of Lasers – O. Svelto
6. Optical Fiber Communications – by Gerad Keiser
7. Optical Fiber Communications – by John M. Senior (PHI)

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U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: VI (B): Modern Optics LAB

1. Study of the profile of a laser beam.
2. Determination of the diameter of a thin wire using laser.
3. Determination of wavelength of He-Ne laser by transmission grating.
4. Construction and recording of a hologram.
5. Study of Fourier transforming properties of lenses.
6. Study of second harmonic generation by KDP crystal.
7. Measurement of numerical aperture of an optical fiber.
8. Measurement of coupling losses in optical fibers.
9. Measurement of bending losses in optical fibers.
10. Study of audio signal transmission through optical fibers.
11. To study the interference of light using optical fibers.

Reference Books:

1) Introduction to Fourier Optics – J. Goodman
2) Optical Fiber Communications- John M. Senior
3) Principles of Lasers- O. Svelto
4) Modern Optics- Grant Fowles.
5) Principles of Optics – Born & Wolf
6) Fundamentals of Optics- Jenkins & White

Note: Minimum of eight experiments should be performed.

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KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: V I (C): QUANTUM MECHANICS AND APPLICATIONS

(DSE- Elective-3)

Unit-I (11hrs)

Schrodinger equation & the operators: Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions.Normalization.Linearity and Superposition Principles.Hermitian operator, Eigen values and Eigen functions. Position, momentum and Energy operators; commutator of position and momentum operators; Expectation values of position and momentum.Wave Function of a Free Particle.

Unit II (11 hrs)

Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigen values; expansion of an arbitrary wave function as a linear combination of energy eigen functions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to spread of Gaussian wave-packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wave function; Position-momentum uncertainty principle.

Unit-III (10 hrs)

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem-square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigen functions ground state, zero point energy & uncertainty principle. One dimensional infinitely rigid box- energy eigen values and eigen functions, normalization; Quantum dot as example; Quantum mechanical scattering and tunnelling in one dimensionacross a step potential & rectangular potential barrier.

Unit-IV (10hrs)

Atoms in Electric & Magnetic Fields: Electron angular momentum. Space quantization. Electron Spin and Spin Angular Momentum.Larmor's Theorem. Spin Magnetic Moment. Stern Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton. Atoms in External Magnetic Fields:- Normal and Anomalous Zeeman Effect. Paschen Back and Stark Effect (Qualitative Discussion only) (12 Lectures)

Text Books:

1. A Text book of Quantum Mechanics, P. M.Mathews and K.Venkatesan, 2nd Ed., 2010, McGraw Hill
2. Quantum Mechanics, Robert Eisberg and Robert Resnick, 2nd Edn., 2002, Wiley.
3. Quantum Mechanics, Leonard I. Schiff, 3rd Edn. 2010, Tata McGraw Hill.

Reference Books:

1. Quantum Mechanics, G. Aruldhas, 2nd Edn. 2002, PHI Learning of India.
2. Cohen-Tannoudji, B Diu and F Laloë, Quantum Mechanics (2 vols) Wiley-VCH 1977 • Basic Quantum Mechanics –A.Ghatak (McMillan India) 2012
3. • Introduction to Quantum Mechanics, D.J. Griffith, 2nd Ed. 2005, Pearson • Quantum Physics----S. Gasiorowicz (Wiley India) 2013

KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: V I (C): QUANTUM MECHANICS AND APPLICATIONS LAB

Use C/C++/Scilab for solving the following problems based on Quantum Mechanics like

1. Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom: Here, m is the reduced mass of the electron. Obtain the energy eigenvalues and plot the corresponding wavefunctions. Remember that the ground state energy of the hydrogen atom is ≈ -13.6 eV. Take e = 3.795 (eVÅ)1/2, ħc = 1973 (eVÅ) and m = 0.511x106 eV/c2.
2. Solve the s-wave radial Schrodinger equation for an atom: where m is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened coulomb potential Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wavefunction. Take e = 3.795 (eVÅ)1/2, m = 0.511x106 eV/c2, and a = 3 Å, 5 Å, 7 Å. In these units ħc = 1973 (eVÅ). The ground state energy is expected to be above -12 eV in all three cases.
3. Solve the s-wave radial Schrodinger equation for a particle of mass m: For the anharmonic oscillator potential for the ground state energy (in MeV) of particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose m = 940 MeV/c2, k = 100 MeV fm-2, b = 0, 10, 30 MeV fm-3In these units, cħ = 197.3 MeV fm. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.
4. Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule: Where μ is the reduced mass of the two-atom system for the Morse potential Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave function. Take: m = 940x106eV/C2, D = 0.755501 eV, α = 1.44, ro = 0.131349 Å

Laboratory based experiments:

5. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency
6. Study of Zeeman effect: with external magnetic field; Hyperfine splitting
7. To show the tunneling effect in tunnel diode using I-V characteristics.
8. Quantum efficiency of CCDs

Reference Books:

1. Schaum's outline of Programming with C++. J.Hubbard, 2000,McGraw---Hill Publication
2. Numerical Recipes in C: The Art of Scientific Computing, W.H. Pressetal., 3rd Edn., 2007, Cambridge University Press.
3. An introduction to computational Physics, T.Pang, 2nd Edn.,2006, Cambridge Univ. Press • Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific & Engineering Applications: A. VandeWouwer, P. Saucez, C. V. Fernández.2014 Springer.
4. Scilab(A Free Software to Matlab): H. Ramchandran, A.S. Nair. 2011 S. Chand & Co.
5. Scilab Image Processing: L.M.Surhone.2010 Betascript Publishing ISBN:978 613345927