

GROUP-53-Prosthetics& Orthotic Technician

(Level of Exam- Matric+ Diploma in Prosthetics)

1) General awareness, Reasoning, Mathematics, Science, History including Haryana related history, current affairs, literature, Geography, Civics, Environment, Culture etc. -

(Weightage 20%)

2) Computer terminology, Fundamentals, word software, excel software, Power point, internet, web browsing, Communication, emails, downloading and uploading data on websites etc.

(Weightage 10%)

3) Subject related syllabus-

(Weightage 70%)

Life/Basic Science

Anatomy-Introduction to human body terminology used, the skeleton classification of bones, terms used in describing bones, The skull, The Thorax, The Vertebral Column, The Pelvic girdle, The skeleton of upper Limb Scapula, Humerus, Ulna, Radius, Bones of wrist & hands, The skeleton of Lower Extremity. The innominate bone, femur, Patella, Tibia, Fibula Bones of the foot, The Joint of the Skeleton classification & Types, Joints of Upper Extremity, Joints of Lower Extremity, Knee, Ankle & Joints of the foot, Myology – the muscle of the skeleton, Name of Muscles & their derivation, Muscle of the head & face- Position, attachments, action & nerve supply, Muscle of the neck, Position, attachments, action & nerve supply, Muscle of the Chest- Position, attachments, action & nerve supply, Muscles of the Back - Position, attachments, action & nerve supply, Abdominal muscles- Position, attachments, action & nerve supply, Muscle of the Upper Extremity- Position, attachments, action & nerve supply, Muscles of the Lower Extremity- Position, attachments, action & nerve supply, Anatomical regions formation & contents of Axilla, antecubital fossa, anterior & posterior triangle of neck, femoral triangle, popliteal space, Living anatomy - recognition of structure in living body by inspection & palpitation, Ability to replace the surface of the living body, the position of the chief structures.

Physiology-Introduction to physiology & different systems of the body, Body fluids, tissue cells, cytoplasm, nucleus, irritability, conductivity, reproduction, Elementary tissue of the body & their functions development & growth of bones, The circulatory system - Heart, Blood vessels attached to it & nerve supply of the heart, cardiac cycle of the heart, cardiac cycle, the heart sounds, the pulse, blood pressure, the cardiac output, circulation of blood throughout body, Principal blood vessels, arteries & veins, The blood composition of blood & functions – the coagulation of blood, The spleen & the Reticula Endothelial system, The classification of food, The digestive system, The liver & pancreas, The respiratory system and respiration, Metabolism, Endocrine glands, Urinary system, Reproductive system, The nervous system - sympathetic, parasympathetic, Organs of special senses and skin.

Introduction to pathology, General pathology, Inflammation – signs and symptoms – types of inflammation, Acute & Chronic inflammation, Infections – Bacteria and viruses, immunity, types, classification, control of infection, cross infection & prevention. Asepsis and sterilization, pyogenic infection – boils, abscess setticamla, Tuberculous infection of bones & joints & management. Fungal infection – actiriomycosis, filariasis, leprosy, venereal disease syphilis, gonorrhoea, virus infection – poliomyelitis influenza, Wounds – types of healing process, Tumours – connected to bones, Vascular disorders- Thrombosis, Embolism, Thrombi angiitis, Obliterans. Arthrosclerosis, hyper lesions, Gangrene – types, causes, signs & symptoms and management, Metabolic disorders – Diabetes, Rickets, Hyper & Hypo-para throidism & parathyroidism, metabolic disorders – Osteoporosis, Inflammation of joints – Arthritis – classification and pathology.

Workshop Technology

Introduction to workshop technology, Bench work-bench vice, leg vice, hand vice, hammers of different types, Files of various types, Chisels, Scrappers & their uses. Hack saws, wrenches, surface plate, angle plate, V-block Centre Punches, dividers & trammels, feeler & surface gauges, Measuring Tools – scales & tapes, callipers, Micrometre, Vernier callipers, gauges, plug gauges, dial gauges, vernier protractors sine bars, indicators, Fundamentals of riveting soldering, brazing and welding, Forging (blacksmith) -the forge & tools used in smithy & forging processes, Drilling-Machine operation, tools holding devices, types of drill, reamers and uses, cutting internal- external threads, by using taps and dies, counter sinking, counter boring, Lathe work-parts of centre lathe and their uses, turning of centre, taper burning screw

cutting in lathe, cutting tools used in lathe, tools speed, feed and depth of cut, Milling types of milling machines, Milling cutter, Up-cut & cone cut milling dividing head, set-up and operation on milling machine, Shaping – Shaping machine and their use, Grinding – The grinding wheels, abrasives, wheel bends, grit & grade, wheel structure, shape, selection, hand grinders, speed & feed, types of grinding & different types of grinding machines, Finishing process polishing, buffing, electroplating, copper, nickel and chromium, Material & Tools used in Prosthetics & Orthotics; - a. Rubber different types uses, density, resilience, utility in prosthetic & orthotic, Plastics-types, strength impregnation, lamination colouring & utility, Ferrous metals – Steel variety & uses, Non-ferrous metals and alloys, aluminium, various suitability, Fabrics, Leather, Plaster of Paris, Adhesive & Fasteners, Special tools & equipment used in prosthetic & orthotic work.

Technical Drawing

Introduction to Engineering Drawing, Definition, terms & uses, Printing letters, Lines, angles, triangles and quadrilaterals, Circles and Tangents, Regular polygon, Ellipse, Cycloid involute of circles, Orthographic projections, Plan, Elevation, Side view, Projections of points, lines & solids (Prisms, Pyramid Cylinders & Cones), including simple case of projections on oblique planes, Projections in oblique planes, auxiliary planes & views, First & third angle method, Full & sectional view of machine parts, Dimensioning the views, conventions used in view, Drawing of principle components, parts like bolts, nuts rivets, keys, locking pins, washers etc., Joints & coupling, rivetted, bolted, keyed, knuckle joints, Conventions in technical drawing, Isometric view of simple objects, Practice in hand sketches, line drawing, various prostheses, orthoses & the Rehab. Aids.

Applied Mechanics & Strength of Material

Simple stress & strains Definition of stress and strains, factor of safety, safe stress, modules of elasticity, longitudinal strain and lateral strains, Poisson's ratio, etc. – stress strain curve, statement of formulae relating between different moduli-simple problems to understand the above principles of composite bars – formula relating to loads & strains in individual members – simple problems to understand the above relations.

Geometric properties of sections Definition of moment inertia & radius of gyration of a solid body. Definition of centroid, moment of inertia of sections, determining of centroid of 'L' section, trapezoidal section. Determination of common centroid for a combination of two circles – simple statement of formulas for regular section namely Rectangle, Triangle & Circle, parallel axis & perpendicular axis theorem.

Shear Free & Bending moments Classification of beams, types of loads, definition of sheaf force & bending moment of a loaded beam, shear force & bending moment diagrams for cantilevers and simple supported beams with concentrated UDL loads - simple problems to determine SF and BM at various points and drawn SF and BM diagrams.

Theory of simple bending Definition of bending stress, neutral axis, moment of assistant fibre stress etc. assumption to be absorbed in the simple bending theory. Derivation of the equation of simple bending. Simple problem of cantilever and simple supported beams with central concentrated load & full load.

Torsion Definition of torsion, angle of twist, polar moment of inertia etc. assumption mode in torsion, statement of torsion equation, simple problems of determine transmitted in solids & shafts only.

Springs Types of springs, uses of various springs, development of formulae for stiffness & deflection of closely coiled helical springs – simple problems.

Rivetted Joints Types of riveted joints, strength of joints, Howin's formula – simple problems in single rivetted & double rivetted lap & butt joints, to determine pitch & efficiency of the joints.

Thin cylinders Failure of thin cylinders, longitudinal & hoop stresses assumptions, derivation of formulae, simple problem.

Friction Principles of friction – co-efficient of, definition of static & dynamic friction, laws of static friction, least force required to drag a body on horizontal plane, angle of repose frictional force on inclined plane simple problems.

Graphic Station Vector representation drawing of space diagram, Bow's notations, drawing of Vector diagrams, Funicular polygon for parallel forces, determination of strength of members in simple cantilever, beams & king post roof stress, drawing of SF & BM diagrams.

Electronics & Bio-Electricity

Fundamental of Electricity Ohm's Law. Resistance in Parallel & series AC + DC resistance capacitance, impedance-power, power factor, transformers, meters.

Elements of Electronics Vacuum tubes, Diode, Electrode, Tetrode, Pentode, Electrification, valve as rectifier valve as amplifier semi-conductors, integrated circuit, computers.

Bio-Electricity Biological potentials, muscle action potentials, electromyography, myoelectricity control of artificial arms, Bio-cybernetics.

Orthopaedics

Introduction to Orthopaedics, Principles of Orthopaedics, Congenital deformities, Diseases of Nervous System, Poliomyelitis, Obstetrical paralysis, Spastic paralysis, Hemiplegia, Paraplegia, Pyogenic infection, Tuberculosis, Leprosy, Chronic arthritis, Rheumatoid arthritis, Osteoarthritis, Neuropathic arthritis, Metabolic diseases, Rickets, Avitaminosis, Renal osteo-dystrophy, Bone tumours, Trauma, Fractures upper extremity, Fracture lower extremity, Spine dislocation, Management of fracture.

Amputation

Introduction to amputation surgery – indications, Principles of amputation, types, techniques, Amputation in children (Upper & Lower Extremity), Amputation in adults (Upper extremity) and its complications (various levels), Amputation in lower extremity & its complications (various levels), Postoperative care of the stump properties of good stump, Examination & prescription, Stump dermatology, Common skin diseases and their management, Stump hygiene, Latest techniques of amputation Myo-diesis – Myo-plasty, Immediate post-operative fitting or prosthesis for lower extremity amputation.

Kinesiology & Bio- mechanics

Definition of Kinesiology & Bio-mechanics, Diagram & Bio-mechanics, Origin & Development of Kinesiology, Definition of Kinetics & Kinematics, Centre of gravity of human body, Segment masses & the density of parts, the whole-body centres of gravity, Segment of centres of gravity, Origin of human movements & its significance, Forms of human movement their characteristics & factors affecting them, Analysis of movement, Body links and motion of parts, Closed chain systems, Open chain system,

Four bar mechanism, Measurement of joint motion, Electro-goniometric method, Mechanics of the spine, Lumbar discometry, Locomotor studies, Bio-mechanics of lower extremity, Bio-mechanics of upper extremity, Gait analysis, Bio-mechanics of squatting.

Prosthetics (Upper Extremity)

Medical (i) Classification by level of amputation. (ii) Medical consideration applied anatomy and pathological consideration. (iii) Classification of congenital skeletal limb deficiencies. (iv) Prosthetic prescription. (v) Amputee trainee.

2. Technical (i) Components of upper extremity prostheses, control & harness systems. (ii) Fabrication principle & procedures for upper extremity prostheses. (iii) Measurement fitting & alignment. (iv) Check-out & care of B.E. prostheses. (v) Bio-mechanics of U.E. prostheses. (vi) Harness & control systems Below Elbow harnessing & this causes, shoulder amputee harnessing. (vii) Clinical aspects of U.E. prosthesis. (viii) Training in the use of U.E. prosthesis. (ix) Electro-mechanical myoelectric and other externally powered prostheses. (x) Study of publication sources for updating information on upper limb prostheses.

Orthotic (Upper Extremity)

1. Medical (i) Functional anatomy of the hand. (ii) How to train the patients to use functional splint & arms braces.

2. Technical Measurement, selection of materials & components, fabrication & fitting of the following: (i) Static fingers hand splints. (ii) Functional hand splints (iii) Functional arm braces (iv) Feeders (v) Special assistive devices (vi) Myoelectric & other externally powered upper extremity orthoses.

3. Biomechanics of functional hand splints and arm Orthosis

P.M.R.

Introduction to Physical Medicine & Rehabilitation. Muscle charting. 3. Electro-therapy. 4. Hydro-therapy. 5. Application of the above topics in the management of amputees. 6. Neuro muscular diseases type and management. 7. Arthritis, types and management. 8. Crutches & uses, different crutches-gait. Bandaging of stumps, BK/AK etc. Knees, Elbows, Hands, Wrists and Ankles. 10. Gait training & analysis of patients fitted with orthoses & prostheses. 11. Prescription of appliances.

Rehabilitation & Psychological Aspects

Introduction to the subject 2. Visit to various department, of the institution. 3. General idea & definition of prosthetics / orthotics 4. Function of different sections / departments of the institute. 5. Rehabilitation a. Concept of Rehabilitation b. Total Rehabilitation c. Rehabilitation team and role of each member of the team. Psychology of disabled a. Goals & methods of scientific psychology. b. Normal personality, normal growth & development c. Heredity d. Maturation. e. Environment & Learning factors in intellectual & Social Development. f. Psychometry g. Testing & motivation. h. Emotional life of the disabled & psychological assessment. i. Counselling. 7. Social & Vocational Aspects a. Disability & social effects b. home environment of disabled. c. Attitude of the society d. Vocational problems. e. Vocational assessment. f. Vocational counselling and guidance. g. Follow up.

Prosthetics (Lower Extremity)

1. Medical Subjects (i) Levels of amputation & limiting factor (lower extremity). - (ii) Psychological aspects of amputation. - (iii) Classification of congenital skeletal limb deficiencies. - (iv) Prosthetic / Orthotic clinic procedures. (v) Prosthetic prescription. (vi) Immediate & early Prosthetic management.

2. Technical (i) Prosthetic components below knee & above knee. (ii) Examination of stump, measurement, cast taking POP modification, fabrication, alignment & fitting procedures for below knee & above knee amputations (this includes prosthesis for partial foot, chop arts, Syme's below knee, through knee above knee amputations. (iii) Gait analysis of BK/ AK amputees fitted with prostheses. (iv) Check out of below knee & above knee prosthesis. (v) Maintenance & care of prosthesis. (vi) Hip disarticulation & Hemipelvectomy prosthesis. (vii) Bio-mechanics of below knee, above knee & hip disarticulation prosthesis. (viii) Fluid controlled prosthesis. (ix) Modular & other modern types of prosthesis. (x) Development of squatting type prosthesis – Madras & Jaipur port, etc. (xi) Study of publication of sources for updating information on L.E. Prosthesis Examination.

Orthotic (Lower Extremity)

1. Foot Orthoses a. Medical (i) Anatomy of Foot. - (ii) Orthotic - Prescription for different pathological condition, path mechanics of foot & ankles. b. Technical (i) Shoes, boots & their components. (ii) Shoe modifications, principles & procedures in clinical application. (iii) Biomechanics of the foot.

2. Ankle Foot Orthoses K.O. KAFO, EKAFO, GIL, HKAFO a. Medical (i) Path mechanics Lower extremity (including foot, ankle, knee and hip.). - (ii) Introduction to Orthotic management. (iii) Orthotic prescription. (iv) The influence of error in bracing upon deformity of lower extremity. (v) Gait training. - b. Technical (i) Lower extremity orthotic components & functions. (ii) Principles of taking measurements, selection of components, fabrication, alignment fitting and check-out of orthoses. (iii) Analysis of Pathological & orthotic gait. (iv) Study of publications sources for up-to-date information on lower extremity Orthoses.

Spinal Orthotic

1. (a) Medical (i) Surface of anatomy of trunk. - (ii) The Physiological basis of Orthotic methods. - (iii) Orthotic treatment of lumbar & thoracic conditions. (iv) Orthotic treatment of cervical condition. (v) The M.W. brace, exercises for users of M.W. Braces, Braces used in spine.

2 (b) Technical (i) Components of spinal braces. (ii) Bio-mechanics of the spine.

Important Note: The Weightage as mentioned against the syllabus is tentative & may vary.

