

GROUP-12

Fire Station Officer (Level- B.E. in Fire/ (B.Sc.+ Dip in Fire from NFSC)

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%)

1. TOWN PLANING AND SAFETY IN CONSTRUCTION INDUSTRY

Town Planning: Planning surveys, selection of site for urban development, consideration cleats, Topography, Drainage and water supply etc., Types of roads in urban areas communication system and its relationship to the cities. Multi story flats, Group Housing, Group Ware Housing, Commercial complexes, Detached and Semidetached houses in relation to fire risk-, types of housing units, Layout of Housing areas with consideration of site orientation, views and architectural aesthetics.

Basic Philosophy: Structural Soundness, Accident and Hazards – their causes & effect. Accident investigation and reporting. Monitoring of safety performance. Treatment of injuries and rehabilitation. Safety Budget, organization, training, implementation. Safety officers. Safety committee.

Safety in Construction Operations Underground works: - Excavation, drilling & blasting, trenching, strutting, piling & safety in using and operation machinery and equipment relating to above components, Above ground works: Scaffolding, centring, Frame work, Ladders, Concreting wall and floor openings, staircases and railings. Structural steel work including welding, cutting erection etc. Safety in use of related machinery equipment's, Underwater operations: River draining, well sinking, Caissons, under water concreting. Cofferdams & special operation connected with irrigation works. Use of related machinery and equipment's, Movement of Materials & personnel: Heavy / Long items, Railway wagons, Motor trucks, Vehicles and Hazardous materials etc. High rise building, bridges, roads, railways, asphaltting, pneumatic caissons, electrical installations & lifts. Fire prevention and protection: Handling of explosives. Precautions.

Safety in Demolition Operations: Planning & permit, Precautions prior to demolition; Protection of public; Precautions during demolition; Sequence of demolition operations from safety point. Safety measures with respect to building materials including cement, lime, timber, steel, glass, paints, varnishes, and petroleum products.

HEALTH AND WELFARE: Personal protective equipment's; Health, Welfare measures; First aid facilities, Salient Features of safety and Health in The Building and other Construction Workers (Regulation of employment and conditions of service) Act 1996 and central rules 1998 (IS & NB codes).

2. FIRE ENGINEERING

Process of emergency evacuation –special features of personnel movement, Parameter characteristics of the movement of people-practical methods of designing evacuation passages and exists. Evacuation exits and routes - stages of evacuation; Exit Requirements- Planning of evacuation routes and exits - Seating arrangement - Passages and corridors; Smoke control during building design; Mechanical Ventilation; Compartment fires and tactical ventilation.

Classification of building based on occupancy; Fire zone; classification of type of construction according to fire resistance; General fire safety requirements applicable to all individual occupancies. Sitting of detectors as per relevant standards (ISI); Selection and planning of alarm system as per relevant standards (ISI). General requirements and guidelines for the installation of fire detection and alarm system in buildings of different occupancy classification.

General exit requirements as per NBC; Internal staircases; Pressurisation of stair staircases; horizontal exits; fire tower; ramps; fire lifts; external fire escape ladders; Planning of location and calculation of capacity, number and width of exit as per NBC for different occupancy classification

Selection and distribution of portable extinguishers(For class A and B fires) and other fire protection equipment's and systems for different occupancy classification as per NBC; Planning of fixed firefighting

installation for different occupancy classification- sprinkler system; total flooding system; CO2 system; foam system; Fire training and education- Arson - Fire safety audits - Risk assessment -Fire insurance. Fire Investigation

3. FIRST AID AND EMERGENCY PROCEDURES

Aims and Objectives. First Aid principles-Role of the first aider-sequence of action on arrival at scene. Vital signs-breathing -pulse. Introduction to the body-basic anatomical terms-body cavitieshead-cranium - thorax-abdomen and pelvis. Biomechanics - Structure and functions of musculoskeletal systems, tendons, ligaments, fascia, bone, muscles, joints and basic mechanisms. The respiratory systemrespiratory failure - asphyxia-abdominal thrust in Heimlich manoeuvre. Chest injuries-types-fractured ribs -pneumothrox-haemothrox.

The nervous system-functions-components-brain - cerebrum - cerebellum - medulla Oblongata-cerebral, spinal fluid-spinal cord-autonomic nervous system. Unconsciousness-causes-level of consciousnessmanagement of unconscious casualty-problems of unconsciousness. Fainting-recognition-managementaftercare. Diabetes -hypoglycaemia -hyperglycaemia-management. Seizures (epileptic fits, convulsions) features- management, stroke. Head injuries-fractures of the base-vault and sides of skull

The circulatory system-heat attack-chest compression- CPR Shock-causes-signs and symptomsmanagement of shock. Eye-eye injuries-foreign body in eye-eye trauma-corrosive chemical in eye-arc eye. Wounds bleeding classification-types of wounds-case of wounds-bleeding from special sites.

Fractures- classification of fractures-principles of immobilization- sprains and dislocation. Broad and narrow fold bandages-hand bandages-slings. The skin. Burns-rule of nines-pure thermal burns. Electric burns. Chemical burns. Radiation burns. Cold burns. Poisoning. Physical fitness. Lifting - casualty handling. Use of stretchers

4. HEAVY VEHICLE AUTOMOBILE ENGINEERING AND SAFETY

ENGINES:Engine Classification, construction, details of Engine Components. Combustion in S.I. Engines, Combustion in C.I. Engines, Study of fuel system components, Function of carburettor's, construction details, Type of Study of diesel fuel feed systems-, Carburetion and mass distribution of mixture, supercharging, fuel injection and injection sections, Clutch, Types, Construction, Operation and Fault finding of clutches. Transmission assembly, Types of Gear box, Functions of gear box, operation and maintenance of gear box.

Differential: Necessity, Construction of differential systems, Axles, Types and Application-, Brakes, Types, Construction and Operation of Hydraulic, Pneumatic Brake Systems, Maintenance of Brakes. Suspension, Necessity, Types, Construction and operation, Shock absorber, Coil springs, independent suspension, Steering, Systems, Constructional details, types of steering gear box, steering geometry, caster, camber, king pin inclination, Effect of steering geometry on directional stability, Power steering

Electrical System: Ignition Systems, Magnet ignition, Battery Ignition, Electronic Ignition, Merits and Demerits, Working, Self-Starter, Dynamo voltage regulator, Battery construction, operation and maintenance; pollution, Air-pollution, Euro norms, Pollution Control techniques.

Lubricating System: Types, Components, Lubricating oil, Cooling System, Detail of Components, Study of Systems, Types, Miscellaneous, Special Gadgets and accessories for Fire Fighting vehicles, Automobile Accidents, CMV Rules regarding safety devices for Drivers, Passengers, Fire fighting vehicles & Appliances. Construction & operation of fire fighting vehicles & appliances, Construction & Operation of Fire boats & other Water borne applications, Rules & regulations of RTO; Laboratory testing of vehicles; Road testing of vehicles. Automobile safety devices.

5. FIRE PROTECTION WORKSHOP

Study of elements of fire and their use, Study and use of different extinguishing Hand Appliances - water, foam, dry powder, ABC Powder, CO2, Halon, Study of basic fire protection equipment's, Study of Modular Automatic Fire Extinguishers, Trolley Mounted fire extinguishers, Study of Fire Protection systems, Fire Alarm System, Manual, Electric, & Automatic Fire Detection System, Study of Water sprays system, Study of Mobile firefighting Equipment's Mobile Monitors, Tractor, Pumps, Fire.

6. SAFETY ENGINEERING AND MANAGEMENT

Introduction-Safety-Goals of safety engineering. Need for safety. Safety and productivity Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. History of safety movement. Theories of accident causation, Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages

Accident prevention Methods- Engineering, Education and Enforcement, Safety Education & Training - Importance, Various training methods, Effectiveness of training, Behaviour oriented training. Communication-purpose, barrier to communication. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Cost of accidents, Computation of Costs- Utility of Cost data. Plant safety inspection, types, inspection procedure. Safety sampling techniques. Job safety analysis (JSA), Safety surveys, Safety audits. Safety Inventory Technique.

Accident investigation –Why? When? Where? Who? & How? Basics- Man- Environment & Systems. Process of Investigation -Tools-Data Collection-Handling witnesses- Case study. Accident analysis - Analytical Techniques-System Safety-Change Analysis-MORT-Multi Events Sequencing-TOR.

7. ELECTRICAL FIRE SAFETY

Generation: - Different types of Generating Stations, their equipment's, Possible Faults and safety measures.

Transmission: - Transmission lines, their equipment's, Possible Faults and safety measures.

Distribution: - Substation their equipment's, Possible Faults and safety measures. Transformer: Their types, Working Principal, Applications, Possible faults & Safety measures.

Electrical Safety Equipment's: - Relay Fuses, Circuit Breaker, Insulators – Their types and applications

Earthing: - Their methods and applications.

Insulation: - Their types and applications Static Electricity & its protection Indian Standards

8. PUMPING MACHINERY AND FLUID MECHANICS

Hydraulic Machinery: Principles, Dynamic Section of Fluid, Dynamic force and torque executed by fluid jet on plain, curved stationary and moving vanes-, Velocity Diagrams, work done by impact, pressure due to deviated flow; Pumps (Positive Displacement Pumps) Reciprocating pumps; Basic theory, types, construction, installation characteristics and operation and accessories.

Centrifugal pumps and its characteristics: Other water lifting devices, Ejector pumps, Air-lift pump installation operation. -Parallel —Series, Centrifugal pumps. Pump Section, Maintenance and application.

HYDRAULICS: The flow of water through open channels, pipe hose and nozzles. Measures of flow, pressure and pressure drop. KINEMATICS OF FLUIDS; FLOW: Type of flow, path lines and stream lines, equation of continuity, one dimensional method of flow analysis.

DYNAMICS OF FLUID FLOW: Energies-potential, pressure and kinetic, Momentum and energy equations for steady flow, Bernoulli's theorem and its applications.

FLUID MEASUREMENT: Pressure measurements, use of piezo-meters and static tubes, velocity measurements, use of pitch-tubes, current meters. Discharge measurement, use of venturi-meter. Orifice -meter.

9. RESCUE EQUIPMENT AND TECHNIQUES

Hydraulically and pneumatically operated tools and equipment's: - Hydraulic Jack, Hydraulic Cutter, Hydraulic Expander. Air Lifting Bags, Electric Power Tools: - Electric Cutter, Electric Saw, Chain Saw etc. Small Gears: - Their types, Applications and working principal Ladders: Constructional features, their types, Material and applications Ropes: - Their types, material and applications.

General Introduction- Emergency Rescue Tender, Water Tender, Foam tender, Multipurpose Tender Hydraulic Platform, Turn Table Ladder, Canteen Van and Ambulance; Fire Extinguishers: - Their types and Applications. Rescue by Ordinary Means

Different types of Knots & Hitches and their applications in emergency Carries & Drags: Fireman carry, two men carry, three men carry, four men carry, chair carry, stretcher carry and different types of Drags. Rescue problems and their remedies, Rescue from High rise buildings, Rescue from major disasters Earthquake, Flood, Drought, Tsunami etc. Rescue from Fire incident

Respiratory Equipment's: Respiratory Physiology, Composition of Air, Breathing, Breathing Rate, Calculation of the capacity & time duration of the B.A.Set. Artificial Respiration and their techniques, Enunciator, B.A. Set: - Their types, Constructional features, Working Principal and Applications, Gas Masks: Their types, Constructional features, Working Principal and Applications.

10. BUILDING DESIGN AND DRAWING

Drawing of Building Elements: Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of doors, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

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Building Planning – Provisions of National Building Code, Building bye-laws, open area, setbacks, FAR terminology, principle of architectural composition (unity, contrast, etc), principles of planning, orientation.

Building Services: Introduction of Building Services like water supply and drainage, electrification, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

Design and Drawing of Building – Design and preparation of detailed drawings of various types of buildings like residential building, institutional buildings and commercial buildings, detailing of doors, windows, ventilators and staircases etc.

Perspective Drawing – Elements of perspective drawing involving simple problems, one point and two-point perspectives, energy efficient buildings.

11. SALVAGE EVALUATION OF FIRE

Concept of Salvage at planning stage, Salvage Operation and difficulties encountered. Various items of equipment necessary in salvage operation.

Evaluation of fire situation: Fire loss calculation, Flame temp. Measurement, Calculation for heat release rate, Salvage operation in different types of occupancies silk hotel, Hospitals, Departmental Stores and basement god owns etc.

Follow up action and investigation of Fire situation such as structural Fire, Wild Fire and Auto mobile Fire etc.

Case Studies of Salvage Operations in different types of occupancy.

12. FIRE PREVENTION & PROTECTION MEASURES

General principles of fire prevention and protection measures: Planning and Construction of the building: Site planning considering the nature of the plant, building, equipment and process from the stand point of safety and fire protection, where corrosive, poisonous, explosive and easily combustible materials are handled and processed. Type Of construction fire wall, barricades etc. Fire separation, fire steps, segregation, isolation.

Internal planning and combustion of plants and buildings: Layout of hazardous pipe lines, vessels and equipment, planning of strategic points and selection of fire extinguishing device, Automatic, fire doors, fire, doors, wire glass windows, fire walls, parapeted to prevent spread of fire through roofs, vertical cut offs, Exits, guard & guarding, floor platforms, path roadways, stairs ventilation. Protection and devices for fire due to lightening.

Fire Protection arrangement: Fire appliances: Fire warning system (Manual & Automatic) fixed fire-fighting installations: Foam system; Gas/vapor system; Dry powder system; Special safety protection equipment-Explosion detection, venting and suppression system, Inert gas clean agent system and F.M. 200. Different Extinguishing properties & application like water, foam, carbon die oxide, dry chemical powder, halogenated agent and halon alternatives. Lighting: lighting arrangement and minimum light require in domestic, commercial, industrial and public assembly occupancies etc. Emergency lighting system

Safety and fire protection organization:(a) House-keeping and management; (b) Plant fire brigade and fire fitting facilities, petrol, systems. Detailed analysis of fire case studies: especially those fires where large number of people have been involved. Interaction and relative value of the components of escape route design, especially smoke movement and control.

13. NUCLEAR SAFETY AND RADIOACTIVE MATERIALS

Radio Active Material – Basic theory Principles and Techniques of radiation dissymmetry. Techniques of area and air monitoring. Techniques of personnel radiation protection.

Sources and characteristics of radioactive waste and their types and their method of disposal, Handling and prevention of radiation emergencies and Storage requirements of radioactive materials

Firefighting and rescue operations in the presence of radiation hazard. Pre plan of radiation incident.

Radiation Safety in Nuclear Power Stations

14. LEGAL ASPECTS OF SAFETY, HEALTH AND ENVIRONMENT

Factories Act- Definitions, Preliminary, inspecting staff, Health, Safety, Provisions relating to hazardous processes, Welfare, Working hours of adults, Employment of young person's Special provisions. Dock workers (Safety, Health and Welfare) Act and Regulations-Definitions Powers of Inspectors, Power of Govt. to direct Inquiry, Obligation of dock workers. Duties of Safety Officers, Reporting of accidents, Emergency Action Plan, Safety Committee.

Workmen's Compensation Act: Definitions, Employer's liability for compensation, Calculation of amount of compensation. ESI Act and Rules: Applicability to Construction, Definitions and Benefits as per the Act & the Rules Public Liability Insurance Act and Rules-Definitions, Calculation of amount of relief Environmental Relief Fund, Advisory Committee, Powers of District Collector, Extent of Liability, Contribution to Relief Fund.

Explosives Act and Rules: Definitions, Categories of Explosives, General Safety Provisions, Use of Explosives Grant of license, Notice of Accidents, Inquiry into ordinary and more serious accidents, Extension of definition to other explosive substances. Petroleum Act & Rules - Definitions, Control over Petroleum import, transport, storage, production, refining and blending, Need for license, exemption, Notice of Accidents and Inquiries.

Water Act- Definitions, Powers and Functions of Boards, Provisions regarding prevention and control of water pollution, Power to make rules, Rules on Consent for Establishment and Operation. Air Act - Definitions, Power & Functions of Boards, Prevention & Control of Air Pollution, Consent as per Air Pollution Rules. Environment (Protection) Act and Rules- Definitions, general powers of central government, prevention, control and abatement of environmental pollution, standards for emission, prohibition and restrictions on siting and operation of industries. MSIHC Rules Definitions, Duties of Authorities, Notification of Major Accidents Safety Reports, Safety audit, MSDS, On-site & Off-site Emergency Plan, Giving safety information to public.

15. FIRE SAFETY CODE AND STANDARDISATION

Specification of Rescue and Fire: Fighting equipment and appliances viz., TP, Water Tender C. F. T. and I.S. Standard (IS 948, IS 950 IS 6067, IS 10460 ,IS 4989 (PART-1) IS -4989(PART-3),IS -949,IS 951,IS 944 , IS 2930,IS-947 IS 6070, IS 957 ,IS-946 ,942 , IS-8090, IS-2190 ,IS-903 IS-636

Salvage Tender Emergency Tender, Rescue tender, DCP Tender IS-10993, IS-949,

Code concerning construction and design of buildings. NBC -1983

Code of practice for construction of temporary structures and pandals IS -8758 Codes relating to fire ratings of materials used. Municipal Bye- Laws in relating to fire prevention , industrial fire Prevention and Protection enforcement.

16. FIRE FIGHTING AND SAFETY EQUIPMENT

Hose and Hose Fitting: Details study of hoses, coupling, branches, branch holders, Monitors, Nozzles, Stand Pipes, collecting Head, Suction hose fittings Breaching, Adaptors and Ramps.

Portable Fire Extinguishers: Constructional features, Specifications and applications, Extinguishers using water, mech, Foam, co2 dry power Extinguishers and Light Water,

Foam and foam Making Equipment: Types of foam, Foam making equipment, properties and characteristics of good foam, practical Consideration, care and maintenance.

Personnel Protective Equipment's: complete Head to Toe protection Head Protection – Helmets their types material of construction and reliability Face protection- Face Shields, their types, material of construction and reliability Body protection- Aprons, their types material of construction and reliability Hand protection- Hand Gloves, their types material of construction and reliability Leg protection- Shoes, Gum Boots their types material of construction and reliability Fall Protection – Safety Belts, their types, material of construction and reliability.

17. IDENTIFICATION AND RISK ASSESSMENT

Hazard and risk, Types of hazards - fire, explosion and toxic gas release, Structure of hazard identification and risk assessment. Identification of hazards: Inventory analysis, Fire and explosion hazard rating of process plants -The Dow Fire and Explosion Hazard Index, The Mond Index, Plant layout and unit hazard rating, Preliminary hazard analysis, Hazard and Operability study (HAZOP), What If analysis, Case studies.

Plant availability and process reliability: ways of improving plant availability, MTBF and MTTF, the reliability function, failure rate, bathtub curve, probability relationships, simple reliability estimation. Estimation of frequency of occurrence of a hazard: The logic tree approach, set theory and Boolean algebra, application to probability, Boolean manipulation. Fault tree analysis - logic symbols, minimal cut set, logic gates, fault tree quantification. Event tree analysis-notation, event tree construction, advantages and disadvantages of ETA. Failure mode and Effect Analysis (FMEA) - methodology, criticality analysis, corrective action and follow-up.

Consequence modelling: Source models - discharge rate models, flash and evaporation, dispersion models. Explosions and fires - vapour cloud explosions, flash fires, physical explosions, BLEVE and fire ball, confined explosions, pool fires, jet fires. Effect models-dose-response functions, probit functions, toxic gas effects, thermal effects, explosion effects - Software application for effect and damage calculations.

Quantification of risk: QRA, Vulnerability analysis, accepted and imposed risk, perception of risk, risk indices, individual risk and societal risk, acceptance criteria for risk, ALARP, Presentation of measures of risk - risk contour, F-N curve. Calculation of individual risk and societal risk. Human reliability analysis (HRA): factors leading to human error, characteristics of HRA techniques, Technique for Human Error Rate Prediction (THERP), Accident Sequence Evaluation Program (ASEP), Techniques using expert judgment, Operator Action tree (OAT).

18. HEAT TRANSFER, COMBUSTION AND EXPLOSIVE

Basics and Laws: Definition of Heat Transfer, Reversible and irreversible processes, Modes of heat flow, Combined heat transfer system and law of energy conservation.

Steady State Heat Conduction: Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical co-ordinate systems, Numerical.

Steady State Conduction with Heat Generation: Introduction, 1 – D heat conduction with heat sources, Extended surfaces (fins), Fin effectiveness 2-D heat conduction, Numerical. Transient Heat Conduction: Systems with negligible internal resistance, Transient heat conduction in plane walls, cylinders, spheres with convective boundary conditions, Chart solution, Relaxation Method, Numerical.

Convection: Forced Convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and energy equations, Some results for flow over a flat plate and flow through tube, Fluid friction and heat transfer (Colburn analogy), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal planes & cylinders, Numerical. Thermal Radiation: The Stephen-Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between nonblack bodies, Electrical network for radiative exchange in an enclosure of two or three grey bodies, Radiation shields, Numerical.

Heat Exchangers: Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness, numerical. Heat Transfer with Change of Phase: Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling, numerical.

20. FIRE FIGHTING INSTALLATION AND AUTOMATION

Grouping of Fixed-Fire-fighting Installations, Provisions of First Aid Fire- Fighting Arrangements, External Hydrants, Ring- Mains. Rising Mains: Down Corner, Dry- rises, Wet- rises and specification of each type, their relevant code of practices.

Water Supply & Hydrants System: Grading, Requirement of water supply. Total requirement of water for different hazards pressure tanks water supply, designing of Fire Hydrant System for different occupancies; designing of HVWSS/MVWSS/Sprinklers System: Types of Sprinklers system and its specification New Standard for the installation of Sprinklers and Hazard classification, Rules for spacing Sprinklers and drencher's heads.

Mechanical Foam installation: Determination of foam compound for fire-fighting in oil tanks, Methods of application. Top application Base injection, Sub-surface Injection. Foam inlets and Risk for which foam is used. Premix foams, Installation characteristics of foam. Different types of foam, Low expansion, medium expansion and High expansion foam, their special application, advantage and disadvantage of various types and the storage of foam concentrates.

Installations Involving Carbon-di-oxide and Dry powder: Their special features, characteristics, designing, arrangements, operation, extinguishing action, risk and specification Fire Alarm & Detection System: Designing, Calculations, Testing and Maintenance, Working principle of smoke detectors, heat detectors, Flame detectors & optical beam type detectors.

1. AIR-CRAFT FIRES & RESCUE

General Introduction of Airport, Airport-runways, ATC Tower Hangers etc. Airport Fire Organizations, Water Resources, special appliances and equipment. Aircraft Construction, types, General description and risks associated, crashes and fires, Rescue and Fire-fighting techniques, Ejection seat in Military Air-craft, Fire Prevention in Airport.

2. AIR-CONDITIONING & REFRIGERATION

Introduction, Types of Air-conditioning Systems, Hazards and Structural precautions, Precautions and Special problems associated with each systems, principle of Refrigeration and types, Common refrigerants and their properties, Basic precaution, Hazards and Method of Control in Refrigerating and Air conditioning plant.

3. BREATHING APPARATUS

Introduction and Need/Importance of Breathing Apparatus in Fire Services, Compressed Air Breathing Apparatus-description of the set, face-mask and demand valve whistle manifold and reducer, Airline equipment, Testing and Maintenance, working duration of Breathing Apparatus, Breathing Apparatus Equipment, Distress Signal Unit, Communication Equipment, Guide and Personnel Lines-Calculation of condition and duration. Reference to ISS Specification.

4. BUILDING CONSTRUCTION & STRUCTURAL FIRE PROTECTION

Introduction, Fire Assistance of Elements of structure, Behaviour of Elements of structure in a Fire and Causes of Wall Collapse, Criteria for assessing the fire properties of building materials and Elements of Structure, Fire load and grading of occupancies by fire load, Classification of Building based on occupancy and Fire ones as per N.S.C Occupational hazard and Structural Fire Precautions including Means of Escape-Fire Protection in Buildings.

5. PHYSICS & CHEMISTRY FOR COMBUSTION

Combustion related properties of matter, Mechanism of Extinction- Effects of combustion, spontaneous-combustion, Hazardous materials.

6. DISCIPLINE

Introduction, Discipline vis-à-vis Leadership, General rules and principles of discipline in the Fire Service, Management and enforcement.

7. ELECTRICITY

Sources Generation-methods, conductors, Insulators, Distribution and special hazards of Transformer and Sub-stations, Cables, Junction Boxes, Wiring Systems, Switches-Switch Gears etc. Lighting Lamps, Static Electricity, Electrical Hazards-Shock and Protection, Fire-fighting techniques for live installations.

8. EXPLOSIVE

Introduction, Types of Chemical Explosives, Chemical Classification of Explosives, Principles of Storage & Transportation, Firefighting Classifications and Fire-fighting technique.

9. FIRE EXTINGUISHERS

Construction and Practical use of

- (i) Water type Extinguishers
- (ii) Foam and Mechanical Foam Extinguishers
- (iii) Vapour Forming-Liquids or Gas Extinguishers-use of Halon Extinguishers.
- (iv) Dry Chemical Powder Extinguishers, Maintenance Procedure of all type of Extinguishers, Indian Standard Specifications for different sizes/types of extinguishers.

10. FIRE SERVICE ADMINISTRATION

Structure of Fire Service organization:

- (a) Organisation of Fire Service
- (b) Duties of different level of commands
- (c) Chain of Command
- (d) Ranks and Rank Markings
- (e) Operational Jurisdiction.

Station Administration:

- (a) Introduction to Station Management
- (b) Routines work at Station level
- (c) Duties of Station Officers at Station level to subordinate ranks for supervision and man-management procedure, Liaison Works in other departments and the public at large.

11. FIRST-AID & AMBULANCE AID

Importance of First-aid in Fire Service structure and functions of the body-Blood Circulatory System, Wound accompanied by severe haemorrhage, Direct pressure, Pressure-points. Haemorrhage from an internal organ-signs, symptoms and management, Unconsciousness-causes, clinical-features and classifications, Emergency Care of burns, Respiratory Distress-Causes, signs, symptoms and Emergency care, Shock-causes, signs, symptoms and management.

12. FIXED FIRE FIGHTING INSTALLATION

Introduction, Purpose & principle of installation, Types of Installation-Manual and Automatic Suppression and their use, care and maintenance systems used in India and Regulations as per National Building Code. Codes of Practice prepared by Bureau of Indian Standard.

13. FOAM &FOAM MAKING EQUIPMENT

Introduction, Different foam concentrates, functional requirements & compatibility of foam-concentrate and dry chemical powder, Foam making equipment, Care and Maintenance of Foam making equipment. Reference to relevant Indian Standard Specifications.

14. FIRE HAZARDS IN SPECIAL RISKS AREA AND FIRE PROTECTION

- (a) Towne Other Gas Works
- (b) Oil Installation and Tanks.
- (c) Cross-Country pipelines of Gas mains.
- (d) Industrial Materials and Dangerous Chemicals.
- (e) Places of High Fire/Life Risks.
 - (i) Pressurized Tunnelling.
 - (ii) Oxygen enriched atmosphere.

15. FIRE SERVICE COMMUNICATION

Importance and function of Watch-room and Control room & its requirements. Procedure of handling of fire calls and special Service Calls etc, Identification of Communication requirement of Fire Service, Details of communication requirement of Fire Service.

- (a) Link Communication
- (b) Radio Communication.

Communication Planning in Fire Service.

16. FIRE PREVENTION INSPECTION PROCEDURE

Preparation of check-list and follow-up procedure & maintenance of mastered register.

17. GAS, FIRES

Classifications, Characteristics of gases and their risks, Dust Explosion, LPG, its hazards and Fire Precautions, Methods used by the Fire Service of Extinguishing Gas Fires.

18. HOSE

Introduction, General Characteristics of Standard Delivery and Section Hose, Material, Construction Maintenance, Repairs & Testing and latest development as per bureau of Indian Standard-Reference to relevant Indian Standard Specifications.

19. HOSE FITTINGS

Standard Couplings, Branches and Nozzles special types of Branch and Nozzle, Branch Holders, Radial Branches and Monitors, Stand-pipes, Collecting heads and Suction-Hose Fittings, Breechings, Asaptors, Miscellaneous, Hose Fittings and Ramps. With reference to Indian Standard Specifications.

20. HYDRANTS & WATER SUPPLY

Determination technique of Fire flow' in accordance to fire load, Distribution of water supplies, Water resources for Fire-Fighting, Code of practice in respect of requirements and Standardisation of Hydrants, Hydrant Gear, Use of Flow-Motor, Marking, Testing, Care & Maintenance.

21. HYDRAULICS

Characteristics of Suction Lift and Atmospheric pressure, Pump-power and efficiency, Characteristics of flow in Hose and Nozzle discharge, Friction Loss, Jet-reaction and Water Hammer, Formulae and problems of the above.

22. INTERNAL COMBUSTION ENGINES

Introduction, Principles of Internal Combustion Engine, Terminology used in this connection, description of power Units and the systems in relation to Petrol and Diesel Engines.

23. INVESTIGATION OF FIRE

Introduction, Procedure of detection to the causes of fire-point of Ignition, Time of Ignition and cause of Ignition, Circumstances leading to suspicion and motives leading to Arson, Fire-fighting Techniques in case of Arson and guarding of evidence.

24. LADDERS

Introduction of sophisticated aerial ladder, construction, use, Testing and Maintenance of TTL & Hydraulic platform Method of practical Operation and technique and safety requirement.

25. PUMPS

Introduction-Centrifugal Pumps and its characteristics, different types of Primers, design parameters of Pumping Appliances and their characteristics.

26. PLAN READING

Importance of plan reading, its requirements and preparation of standard symbols, Introduction to the reading of Building plan.

27. PRACTICAL FIREMANSHIP

Principles to be followed at Fire Ground viz. Survey and reeve and sizing up, Methods of Entry, Methods of Search and Rescue, Working in Smoke and Darkness, hot atmosphere, central at a Fire Ventilation and Procedure after fire/incidents, Fire-fighting strategy and tactics.

28. RESCUE DRILLS

Fireman's Lift and picking up Practical drill, Rescue by various methods using fire equipment.

29. RESUSCITATION

Different methods of manual resuscitation, their advantages and disadvantages, Classification of Resuscitation sets, their construction and descriptions. Signs and symptoms of Asphyxiated persons in same special case, cases where artificial respiration not recommended.

30. RURAL & FOREST FIRE

Causes of rural fires, specification, difficulties encountered in rural fires, normal methods and special technique employed in rural firefighting.

31. SALVAGE

Introduction, Importance of Salvage, various factors of damage and their remedy pre-planning and procedure for salvage work before, during and after the fire.

32. SHIP FIRES

Structural terminology of a ship-Causes of fires in ship, Authorities and their responsibilities in case of ship fires. Fires on ships in Dry-Dock, Fire-fighting Procedures, considerations and problems while fighting fire in ship. Fire prevention in ships-Fire Protection in Docks.

33. SMALL GEARS

Function and construction of various sophisticated small gears used in fire services including powered operated gears, Description and Operational use of Oxy-Acetylene cutting sets, Oxy-Propane cutting sets, Pneumatic Jacks, Jumping Cushions, Blower exhauster and various types of Protective Clothing. Powered spreader, Lifting bag, powered saw and cutting tools.

34. SPECIAL APPLIANCES

Emergency Tender, Crash fire, Tender, T.T.L. Hydraulic Platform, Hose Laying Lorry, Break-down Van, Control Units, Canteen Vans, DCP Tender, Foam Tender, as per Standard specifications.

35. SPECIAL SERVICES

Rescue by ordinary Means, Rescue by Fire Service Appliances and Equipment, Rescue from Lift, Rescue from Sewers and Wells, ponds, rivers, Rescue during earthquake and flood, rescue from nuclear Radiation Incident, Rescue Procedure in the presence of poisonous gases, Rescue problems and Rescue procedure in case of Highway accident Water rescue.

36. STORAGE OF HAZARDOUS GOODS

Classification and study of conditions essential for storage of hazardous goods Standard requirements for Transportation of Hazardous goods. Fire Service Authority seizure. Action by Operational Officer at accident of hazchem on road control of Hazchem movement through city during daytime.

37. SQUAD DRILL & P.T.

Physical Training as per Standard Table Demonstration and Practice of all movements of Squad Drill. Word of Command & Instructional practice of all movements including Ceremonial Parade practice.

38. WATER & WATER RELAY

Water requirements with reference to IS. Principles and Practical consideration of various methods of Water Relay and operational hints.

39. WATER TENDER

Study of various Indian Specification of conventional Fire Tenders and appliance as per Indian Standard.

40. FIRE EQUIPMENTS AND APPLIANCES

Hydraulic platform, Advance Rescue Tender, Water Bouser, Water Tender and Foam Crash Tender.

41. FIRE PREVENTION & FIRE PROTECTION

42. KNOWLEDGE OF NATIONAL BUILDING CODE PART-II & IV.

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

