

SYLLABUS FOR THE TRADE OF VESSEL NAVIGATOR

GENERAL INFORMATION

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| 1. Name of the Trade : | Vessel Navigator |
| 2. Duration of Craftsmen Training : | 2 Year. |
| 3. Entry Qualification : | Passed in 10 th class examination under 10+2 system of education with 50% marks in Math. & Science or its equivalent. |
| 4. Unit size | 16 |

DETAILS OF PAPERS FOR VESSEL NAVIGATOR COURSE UNDER NCVT AND EVALUATION WEIGHTAGE FOR EACH SUBJECT

S. No.	Name of Paper as per NCVT pattern	Subject details as per NCVT Syllabus	Subject wise Allocation of marks in question paper		Weightage for evaluation %	Remarks
				Total		
1.	Trade Theory	Seamanship, Safety & Watch Keeping	50	100	50	
		Marine Meteorology & Basic Principles of Oceanography	30		30	
		Elementary Marine Engineering and Naval Architecture & Ship construction	20		20	
2.	Workshop calculation and science	Fishing Gear material accessories and design	20	50	40	
		Fishing Techniques	10		20	
		Marine Fisheries	5		10	
		Fish Processing & Fish Finding Equipments	10		20	
		General English & Applied Mathematics	5		10	
3.	Drawing	Chart Work	50	50	100	
4.	Social Studies	Social Studies	50	50	100	
	<u>Trade Practical</u>					
5.	Practical ó 1	Practical Navigation	100	300	33.33	* Separate assessment on the basis of individual question paper for practical 1, 2 & 3.
6.	Practical ó 2	Fishing Gear Technology practicals & Viva	100		33.33	
7.	Practical ó 3	Onboard training ó Navigational aspects and fisheries including Seamanship and Navigation	100		33.33	

Week No.		Trade Practical (3 Trade Practical, 100 marks each)	Trade Theory	Chart Work (Drawing)	Workshop calculation and Science	Social Studies
NCVT	CIFNET	Total Marks: 300	Total Marks: 100	Total Marks: 50	Total Marks: 50	Total Marks: 50
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
1		Visit to different sections of the Institute. Demonstration on elementary first aid. Artificial respiration etc.		Concept of standard & standardization	Revision of elementary methodical process.	
		Practical 1 PRACTICAL NAVIGATION (Evaluation weightage:33.33%)	Part A SAFETY, SEAMANSHIP AND WATCH KEEPING (Evaluation weightage:50%)	CHART WORK (Evaluation weightage:100%)	Part A FISHING GEAR MATERIAL, ACCESSORIES AND DESIGN (Evaluation weightage:40%)	SOCIAL STUDIES (Evaluation weightage:100%)
2		The shape of the earth. Poles, equator, meridians, Parallel of latitude. Position by latitude and longitude. Bearing distance, units of measurement.	General parts of ship, construction Definition of main dimensions. The names of the principal parts of a vessel Mid ship section of a vessel, Framing, Beam, Maintaining water tight integrity, Freeing ports, Rudders, steering gear, shell and deck plating, bilge keel, double bottoms, sounding pipes, air pipes, stiffening and	Preparation of charts, various types of charts, description of charts, nautical publications Given variation and deviation of the magnetic compass or gyro error, to convert true courses into compass courses and vice versa. To extract the deviation from sample tube of deviations, hence to convert true courses into magnetic and	Introduction to fishing gear materials General outline about fishing gear and utilization of fishing gear materials. Classification of fishing gear materials Natural and synthetic fibres - Origin, sources, extraction and processing details etc.	Part A Social Science Development of industry through five year plans Introduction of five year plans and their importance in the national economy, industrial development and employment generation with stress on current plan. New Economic Policy ó Salient points

			strengthening to resist painting, pounding and longitudinal stresses.	compass courses. To find the compass course between two positions. The use of a single position line in approaching the coast. Reliability of charts		
3		- do -	- do -	- do -	Construction details of twines and ropes Details study about fibre, yarn, strand , ply, twines, rope etc., - Z twist and S twist. Chemical and physical properties Natural and synthetic materials viz., Density, Tenacity, Breaking strength, Elasticity, abrasion, resistance, absorption etc.	- do -
4		Difference of latitude difference of longitude, departure, mean and middle latitude, difference of meridional parts and the relationship between them. Use of position lines with or without run.	Terms and meanings Block co-efficient, Displacement and Dead weight Laws of floating today. Use of displacement and tones per centimetres impression scales to determine weights of cargo or ballast from draught or freeboard.	- do -	- do -	- do -

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			Effect of density of water on draught and freeboard Fresh water allowance. The meaning of the terms Buoyancy and Reserve buoyancy. Centre of gravity, centre of buoyancy. Metacentric height, Righting lever and Righting moment.	- do -	Non textiles or hardware materials Glass, Aluminium, Iron etc. relevance to fabrication of fishing gear accessories. Selection of fishing gear materials With relevance to species specific gear, and fishing technique adopted ó selection of bio-degradable materials in context of relevance to responsible fishing	- do -
6		Celestial sphere, Declination, Azimuth, sidereal hour angle, Ediptic, First point of aries, Greenwich and other standard time, apparent time, sidereal time, Equation of time, Relationship between longitude and time	- do -	- do -	Yarn numbering system Yarn numbering system of twines, its implication in fishing industry ó eg. Direct and indirect system viz. British count, Denier, tex, metric count etc. and their conversions.	Civics a) Salient features of the constitution of India b)Preamble and Directive Principles c)Fundamental Rights & Responsibilities of a citizen Population Growth and its Socio Economic Inspection i) Employment ii) Housing iii) Food iv) Educational v) Clothing vi) Transport vii) Environment viii) Ecological system

			able, unstable and neutral equilibrium. The effect of adding and removing weights on ship's centre of gravity, centre of buoyancy, metacentric height and list. Use of stability and hydrostatic data as supplied to fishing vessels and calculations based thereon.	- do -	Classification of floats Different types of floats, its buoyancy, extra. Buoyancy, selection and purpose related to different fishing gear deployed Fishing gear accessories Thimbles, shackles, danleno swivel, G link assembly C and cut links, recessed link, purse ring, cod end ring etc. ó purpose and uses	- do -
8		Practical problems on plane, parallel and Mercator sailing	- do -	- do -	- do -	- do -
9		- do -	Maintenance of vessels including fishing vessels Safety care and maintenance of all life saving and fire appliances, light and sound signals and safe practices to be followed when fishing	The effect of current on speed. Allowance for leeway. Given compass course steered, the speed of the ship and direction and rate of currents to find the true course made good.	Steel wire ropes Construction, specification, material, braking load, maintenance and preservation ó combination rope, construction material, detail etc.	- do -
10		The use of the traverse tables to obtain the position of the ship at any time, given compass courses, variation deviations and the run recorded by long or calculated by time and	Causes and simple methods of prevention of corrosion in a ship's structure. Hull maintenance, Dry docking, preparation for certificate of inspection	- do -	Sinkers Material selection, purpose and different types, uses. Important fishing gears (General description) Indigenous and modern fishing gears	Salience feature of programme and series i) Temporary and permanent methods of contraception with same knowledge of Anatomy and physiology of Human Reproductive

		allowing for the effects of wind and current, if any			(eg. Seine net, Bag nets, one boat seines, gill nets, lines, trawl nets purse seines, Japanese type set-nets)	system. ii) N C H Services including Immunisation & nutritional deficiency diseases, Dehydration Therapy.
11		- do -	- do -	- do -	Preservation of fishing gear material With special reference to fishing gear fabrication twines ropes, nettings, steel wire rope etc. ó process viz. tanning, tarring, drying, Dyeing etc. ó Classification of preservatives, its method, process and procedures etc. ó Uses for different kind of fishing gear	- do -
12		To find the latitude by meridian altitude of a heavenly body.	Sextant The construction and use of the marine sextant including the optical principles involved. The detection and correction of sextant errors. Chronometer The use and care of marine chronometer and its errors Magnet Compass The use and care of	- do -	FISHING GEAR CLASSIFICATION Active fishing gear, Mechanism of capture in each type of fishing gear in relation to type of fish and fishing ground. NETTING Definition of netting- in dispensable items required for fabrication of netting piece, mesh, bar, knot, top mesh, side	- do -

			magnetic compasses. Magnetic and non-magnetic materials and their effect on the compass. Checking compasses. Practical limitation of the magnetic compass, flux gate compass		mesh, use of different types of meshes, run of meshes-definition.	
13		- do -	- do -	- do -	Different aspects of fishing gear design Need for different designs, basic principles to be followed in designing, designing in relation to fish, gear, and method reading of design and preparation of design. By-catch reduction devices (BRDS) viz. TED, Separator panels, Rigid grid etc. in relevance to the code of conduct for responsible fishing. Behaviour and distribution of targeted species, Fishing design, current, visibility and other factors.	- do -
14		To find position line and position through which it passes from an observation of sun or star	Gyro Compass An elementary knowledge of the use and care of marine gyro	- do -	- do -	iii) Family Welfare Services available at Primary Health Centres and Sub centres, Urban

			Compasses, including the procedure for starting and stopping. Routine oiling and cleaning and its effects. Routine operational checks. Application of latitude and speed error. Bearing Instruments The construction and use of azimuth mirrors. ó Procedure for checking accuracy of azimuth mirrors. The construction and use of a Pelourus.			Family Welfare Centres & Dispensaries, ESI, Railway Hospitals and Dispensaries Awareness, cause and prevention of AIDS/HIV + STD
15		- do -	- do -	To find the course to steer allowing for a current Given the course steered and distance run to determine the set and rate of the current experienced between two positions.	Fishing gear Selectivity Significance of fishing gear selectivity, trawl gear, determination of cod end mesh size - Recent advances in trawl fisheries and mesh selectivity ó Selective trawl, square mesh and cod end, optimum mesh size for multi species trawl fisheries, gill net, advances in hook selectivity.	- do -
16			Maintenance of navigational records Basic knowledge of IMCO recommendations	- do -	- do -	- do -

			Concerning the stability of fishing vessels and use of stability data provided on board			
17		To find the true bearing of a heavenly body, the compass error and hence the deviation of the magnetic compass of the direction of the ship's head. To find latitude by observation of pole star	Loading and securing of catch on board ships Loading and discharging operation with special regard to heeling moments due to gear during fishing operations General knowledge of the measures designed for the protection of the crew on decks, superstructure, at deck opening and on stairway and ladders.	- do -	Shaping Purpose of shaping, method of shaping braiding and cutting, creasing and baiting, fly-mesh comparative advantages of different methods Mounting Necessity of mounting, different methods of mounting in relation to type of gear and method of fishing, stapling and receiving, selvedge and its importance	- do -
18		- do -	Class room practicals Preparing the drawing Other types of vessels in merchant service Class room practicals, preparing stability curves. Collect various stability of the institute training On board the vessel, Dry dock using the equipments and making report	- do -	Otter boards Basic principles function & design of Otter boards, Kites, different kinds of Otter board and construction of otter boards. Size and power of the otter board in relation to type of fishing, size of gear, depth of operation	Awareness and prevention from Drug addition Role of Craftsmen/Craft women in Motivating to adopt small family Norm. i) By adopting centreceptive Technique himself/herself. ii) Acting as motivator in the community and educating fellow

						<p>craftsman/Crafts women for adopting contraceptive Technique to adhere to small family norms</p> <p>Part B Population education National Family Welfare Programme</p> <p>i) Population problem in India</p> <p>ii) Population objection in India till the year 2000 AD and onwards Facts and figures about world population In comparison to India. Recovery of waste heat and recycling of waste materials Linkage of lack of energy conservation and environmental pollution.</p>
19		To prepare neat diagrams for each definitions and make a record book.	- DO -	- do -	<p>Sweep lines Design details, construction and its impact on herding fishes and trawl mouth opening.</p> <p>Gear testing Purpose, methods, instrument for testing</p> <p>Fish behaviour in relation to different</p>	- do -

					types of fishing gear operation Species specific design and reaction of fishes to different fishing gear.	
20		- do -	Sextant practicals for taking altitudes and adjusting the errors. Sketch the equipment, use of VSA and HSA Starting, Transportation and finding the error of the equipment Parts, checking the error Find the deviation, deviation card preparation	- do -	- do -	- do -
21		To calculate position arrived, course, distance using Noris tables and without using tables	Starting, stopping, finding the error Taking the bearing and finding the error	- do -	Universal testing machine operational technique ó Testing of breaking strength, tenacity etc.	- do -
22		- do -	Prepare various navigation records Preparing the stability curve On board practicals while load/discharge On board practicals while fishing and prepare record On board practicals during fishing trip and make a report	To fix a position on a chart by simultaneous bearings bearing and range, positional information from radio aids to navigation or by any combination applying the necessary correction.	Identification of synthetic and natural materials Basic construction detail of fibre, yarn strand etc. Spotters identification. Lab test, burning and smoke test for identification of material	- do -

			Workshop practicals and dry dock and prepare the observation			
23		To calculate the position of the ship at the time of noon of next day using the given information and with the help of traverse tables.	- DO -	- do -	<p>Identification of spotters like different types of floats</p> <p>Other accessories like shackle, thimble, purse ring</p> <p>G link assembly etc.</p> <p>Identification of synthetic fishing gear materials ó</p> <p>Distinguish between bio degradable materials and Non biodegradable material.</p>	<p>Concept of environment & Ecological Balance,</p> <p>The effect of over exploitation of natural resources & industrialization</p> <p>Inter ó relationship between Men & his environment and need for replacement of earth's resources like soil, ground water, Forest, River, Sea & wildlife.</p> <p>Elements of Environments planning & Management</p> <ul style="list-style-type: none"> - Conservation of National Resources - Conservation of wild life - Creation of parks & sanctuaries

			Part B MARINE METEOROLOGY & BASIC PRINCIPLES OF OCEANOGRAPHY (Evaluation weightage:30%)			
24		- do -	General idea of atmosphere, composition and vertical structure, weather and climate, diurnal variation of atmospheric temperature over land and sea, lapse rate, Isothermal layer Atmospheric pressure, semidiurnal and seasonal variations, barometric tendency, isallobar, storm predictions by observations of atmospheric pressure, use of barometric observations and weather signs	- do -	Identification of different type of yarn, twine and training to find out specification of yarn numbering System.	- do -
25		Take the meridian altitude and to calculate the observed latitude and position line using nautical almanac. Calculate latitude, deviation and compass	Water vapour in the atmosphere, humidity, absolute and relative humidity, saturation and dew point, Fohn wind effect, adiabatic lapse rate of temperature, rain	- do -	Spotters identification viz. different types of floats ó Lab test buoyancy and extra buoyancy of floats	- do -

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		altitude of pole star using nautical almanac.	shadow areas of the mountain range Hydrological cycle, evaporation, condensation, precipitation, drizzle, rain, snow flakes, snow pellets, hail, condensation near the ground, formation of dew, frost, rime			
26		- do -	- DO -	- do -	Training on measuring the accurate diameter of steel Wire rope and appropriate specification, construction of wire rope Spotters identification	- do -
27		To work our the problems by various methods such as long by chord, Intercept, ex-meridian. To calculate the compass error and deviation using amplitude and azimuth method.	Visibility, judging and reporting visibility, mist and fog, types of fog- radiation fog, advection fog, orographic fog, smog; Haze, spray and their effect on visibility Clouds- formation, classification due to height and appearance of the ten basic types commonly seen and their abbreviations	- do -	Demonstration of preservation with bark tannin, cutch Coal-tar, copper compound sulphate and ammonia liquid	- do -
28		- do -	- DO -	To fix the position by bearings of one or more objects with the run	Fabrication of netting pieces-Hand braiding, in different dimensions and	1. Type of Pollution & its sources i) Effects of Pollution

				<p>between, allowing for a current and to find the distance at which the ship will pass a given point.</p>	<p>mesh size, using trawl knot, Double sheet knot, Reef knot</p>	<p>on environment and on humanity, plant, Animal, Machine, health & thus on energy conservation. ii) Remedial steps to control pollution iii) Environmental Laws. Part C Energy Conservation & Environment Management Concept of Energy Non-conventional sources of energy like solar wind, bio-gas etc. Energy crisis and Energy scarcity. Principal of Energy conservation, with special reference to - Domestic Appliances & Cooking gas - Transport - Industries including industrial lighting Heating, Ventilation and Air conditioning</p>
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		Practical 2 FISHING GEAR TECHNOLOGY PRACTICALS & VIVA VOCE (Evaluation weightage:33.33%)				
29		<p>Basic netting ó mesh bar, mesh size ó stretch mesh and cross mesh (Run with the mesh and across) Net making implements ó Needle and gauge Basic net making ó practice with trawl knot reef knot (square knot double knot etc.)</p>	<p>Pressure and wind systems, isobars and pressure gradient, meaning of veering, backing, gust and squall, Buys Ballots law, cautions for applying Buys Ballots law, coriolis force and its significance, coriolis parameter True and apparent wind-their meaning and difference, estimation of direction and force of wind at sea, katabatic and anabatic winds</p>	- do -	<p>Fabrication of netting pieces includes shaping viz., Baiting, creasing , flu mesh, doubling of mesh etc. Tailoring procedure in machine made netting includes point cut, bar cut, mesh cut and combination cut.</p>	- do -
30		- do -	- DO -	- do -	<p>Measurement of bar length, stretched length of a mesh etc., Special emphasis on square mesh fabrication. Mounting as well as joining of netting pieces. Vertical joining, Horizontal joining, mesh</p>	- do -

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					to mesh and with additional half mesh.	
31		Shaping of netting by braiding, creasing, baiting	General circulation of atmosphere, doldrums, ITCZ, thermal equator, Trade winds, motions of earth, seasons, perihelion and aphelion	- do -	Training in all type of mountings adopting horizontal and vertical mounting, relevance to different type of fishing gear.	- do -
32		Shaping of netting by tailoring	- DO -	- do -	With help of visual aids and models otter board function and design details. Eye splices in steel wire rope ó short and long splices and back splices in p.p. ropes.	- do -
					Part B FISHING TECHNIQUES (Evaluation weightage:20%)	
33		- do -	Tropical revolving storms, tornado and water spout, pressure and wind distribution in the Indian ocean sector, jet streams	- do -	Different type of fishing boats, general description Indigenous type, mechanised boats, modern type of fishing vessels.	Working conditions & workers education a) Preliminary knowledge about the Social Security legislations as covered by the following Acts. i) Factory Act, 1948 ii) Workmen Compensation Act, 1923. iii) ESI Act, 1948

		netting, Top & side mounting, different methods Hanging ratio. Joining of netting	monsoon- SW and NE monsoons, periodic and local winds, Norwesters and Elephantas, land and sea breeze	- do -	Fishing methods Important indigenous methods, Beach and shore seines, bag nets, set net and line fishing.	- do -
35		- do -	- DO -	Fixing the position by means of horizontal angles. Three point bearing method, Right ahead method.	Modern Fishing methods a) Trawling b) Gill netting	- do -
36		Mending	Cyclones and anti cyclones, cyclone prone regions, cyclogenesis area, ideal conditions for the formation of TRS, structure of TRS, warning signs	- do -	Modern Fishing methods c) Long lines d) Purse seining	- do -
37		Fabrication of different type of model trawl nets, Purse seine nets, gill net and simple hook line and Long line	Weather reporting system- A knowledge of weather messages available for shipping, classification of Voluntry Observing Fleet(VOF), weather bulletins in Indian waters, weather warnings and signals A detailed knowledge of the Meteorological instruments normally used on fishing vessels- Marine thermometer, Barometer, Barograph, Whirling Psychrometer,	- do -	Modern Fishing methods e) Trolling f) Trapping The above topics also to be dealt in context of cod of conduct for responsible fishing.	- do -

			anemometer and wind vane			
38		Splicing ó rope splicing and wire rope splicing. Fabrication of model nets	- DO -	- do -	Code of conduct for responsible fishing Selective fishing gear and practices ó Environment and eco-friendly fishing gears and enhancement of resources.	iv) Employment standing order 1946 v) Payment of wages Act, 1936 vi) Minimum wages Act, 1948 vii) Industrial Disputes Act, 1947 viii) Contact Labour (Regulation & Abolition Act 1970) ix) Employees Provident Fund and Payment of Gratuity Act, 1952.
39		Fabrication of squire mesh cod-end and BRDS models	Sea surface current system in Indian Ocean Sector, Equatorial current system during NE and SW monsoon periods Physical properties of ocean-temperature, salinity, density, General distribution of temperature and salinity in ocean, thermocline and halcoline regions Ocean waves, wave parameters, classification of waves, sea and swell waves, Internal waves,	- do -	- do -	- do -

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			mean tides, tidal ranges, spring and neap tides, ebb and flood tides			
40		Viva Voce Fishing Gear Material, Accessories and Design Fishing Technique Marine Fisheries, Fish Processing & Fish Finding Equipments	- DO -	- do -	Energy conservation Fishing gear and modern methods/ Modern fishing vessels and its technology Fishing accessories Fishing accessories ó winch, gurdie, Rollers, Line-haulers, Power blocks, Purse seines	- do -
		Practical 3 ONBOARD TRAINING - NAVIGATIONAL ASPECTS AND FISHERIES INCLUDING SEAMANSHIP & NAVIGATION (Evaluation weightage:33.33%				
41		Onboard practical on Navigational Aspects and Fisheries Preparation for sailing	Analysis of weather maps by plotting isobars and isotherms	Navigation and voyage planning in all conditions. Making land fall or proceeding along the coast in thick and clear weather.	Fishing accessories Fishing accessories ó davite, gallows (single and double) fair leads, derricks, Pulley system, Mast rigging.	- do -
42		- do -	- do -	- do -	Deck lay out Various types of deck layouts for different types of fishing	- do -

					including combinations. 1.Gill netters ó Bow pickers, tern picker and reel gill netter	
			Part C ELEMENTARY MARINE ENGINEERING (Evaluation weightage:10%)			
43		- do -	Fundamentals Basics of Physics - Heat engines -Terminology of I.C. engines - Classifications of I.C. engines Standard marine phrases	- do -	Deck lay out 2.Trawler – Stern trawler, side trawler and outrigger trawler 3.Purse seiner 4.Long liner 5.Combination vessels etc. (Trawler ó purse seiner, trawler gill netter, multipurpose)	b) Occupational Hazards& Safety measures i) Causes of Accidents and safety management ii) Theories of accident prevention iii) Medical First Aid iv) Selection & use of personal protection equipment of different types v) Use of Fire-safety equipment vi) Safety legislation
44		- do -	- DO -	- do -		- do -
45		- do -	Principles of operation of I.C. engines Working Principle of four stroke engine - two stroke engine	- do -	- do -	- do -

		Navigational Aspects and Fisheries Preparation for sailing	- DO -	- do -		- do -
47		- do -	Cycle of operation - P.V. diagram two stroke - four stroke engines - Valve timing diagram two stroke - four stroke engines - Indicator diagram	- do -		Human Relations & Trade Unions a) Organisational structure & employer ó employee relations b) Purpose and function of Trade Unions with respect to Trade Union Act & Amendments. c) Responsibilities & Duties of workmen towards i) Society ii) Organisation iii) work iv) Vis-à-vis work culture
48		- do -	- DO -	To find the time and height of high and low water at standard ports.	Drawing practice and design of a) Fishing gear design of different type of trawl, purse-seine and Gill net.	- do -
49		- do -	Port Timing diagram	- do -	b) Deck equipment and fishing accessories	- do -
50		- do -	Advantages Disadvantages - Difference between two stroke & four stroke engines - Heat balance	- do -	Drawing practice and design of Deck layout of all types of fishing vessels including combination	- do -

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					vessel	
51		Onboard practical on Navigational Aspects and Fisheries Watch keeping on the bridge	- DO -	- do -	- do -	Part D Entrepreneurship Need and scope for self-employment with special reference to self-employment schemes and sources of assistance in central and State Govts, Organisations I DIC, SIDA, SISI, NSIC, SIDO, financial institutions and National Banks
					Part C MARINE FISHERIES (Evaluation weightage:10%)	
52		- do -	Components of marine diesel engine Understanding the construction of the engines	- do -	Introduction to Marine Environments Ecology, Habitat, Biosphere, Biotope, Ecosystem, Estuaries etc. Physical and chemical factors (biotic & abiotic), and their importance, Inshore and Offshore regions, Pelagic and benthic zones, continental shelf, continental slope, Littoral and deep sea, Sandy, rocky and muddy shores and	- do -

					characteristics of the organisms in these zones	
53		- do -	- DO -	- do -	Marine Population its interaction in the Ecosystem Plankton, Nekton and Benthos Role of plankton, and benthos in Fisheries Marine Capture Fisheries Difference between Cartilaginous and bony fishes	- do -
54		- do -	Components of marine diesel engine	Information given on a chart or plan particularly about Buoys, lights, Radio Beacons, Navigational Aids, depths and nature of bottom, use of soundings, recognition of the coast and Radar responsive targets ó depth and height contours	Marine Capture Fisheries An elementary study of a typical fish, General character of fishes ó its various vital systems. Marine fishes and fishery resources of India, pelagic, mid-water and benthic fisheries	- do -
55		- do -	Components of marine diesel engine Identification of parts	- do -	Fish Behaviour and population Migration of fishes Regular horizontal migrations ó Anadromous, Catadromous, regular Vertical Migration,	(a) Characteristics of a successful entrepreneur and a successful enterprises. (b) Special objectives of business and entrepreneurship (c) The causes of

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					Physical, Chemical and Biological aspects of fish migration	failure, identification of entrepreneurship abilities through self assessment & other techniques (d) The type of business in different trades and the importance of skill
56		- do -	- DO -	- do -	Fish Behaviour and population Other behaviour of fishes Shoaling behaviour of fishes, Shoaling behaviour of oil sardine, mackerel, tuna Fish Population study Fish stock ó Abundance of fish and factors limiting abundance, Catch per Unit Effect index (CPUE)	- do -
57		Onboard practical on Navigational Aspects and Fisheries Use and maintenance of LSA & FFA	Free hand Sketching of all parts with emphasis on liner, piston, connecting rod etc.	- do -	- do -	- do -
58		- do -	- DO -	- do -	Identification of selected plank tonic organisms phyto and zooplankton benthic organisms. Elementary study of fish and its various parts- scales, fins etc. and basic identification methods	- do -

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			- DO -	- do -	- do -	Understanding the consumer and market through consumer behaviour Market Survey, Scope and influence, publicity and advertisement, consumer action forum
					Part D FISH PROCESSING & FISH FINDING EQUIPMENTS (Evaluation weightage:20%)	
60		- do -	Components of marine diesel engine	- do -	Handling and transport of fish Handling fish and prawns onboard the fishing vessel ó people involved in the process, washing and sorting, supply of clean water, evisceration, time, bleeding, packing and transport, containers for transport, transportation of live fish, personal hygiene in fish handling	- do -
61		- do -	Components of marine diesel engine	Use of sailing directions, Admiralty catalogue of charts and list of lights. To understand the use of Notices of Mariners and to be familiar with the	Spoilage of fish Principal constituents (biochemical) of fish, Microbiology of a tropical fish, Post mortem changes in fish,	- do -

				<p>process of chart correction. To understand the dangers of placing implicit reliance upon floating navigational aids. To understand the use of Decca lattice charts and Decca correction sheets.</p>	<p>Assessment of freshness of a fish and the methods, Fish spoilage ó Agencies of the spoilage of fish ó Bacterial spoilage, Enzymatic spoilage, Spoilage in fresh water and marine fishes.</p>	
62		- do -	Components of marine diesel engine	- do -	<p>Fish Preservation methods – post harvest methods Fish thawing, Chilling and Curing methods ó icing and its types, freezing and different types, freezing in fish and prawns, salting and drying and its different types, smoking, its different types, canning and its problems,</p>	- do -
63		- do -	Components of marine diesel engine	- do -	<p>Fish Preservation methods – post harvest methods Irradiation preservation and other preservation methods, Seafood quality assurance systems in India ó IPQC and HACCP standard Value added products Pickling of fish, Mas</p>	<p>Product and site selection, Finance, Account keeping, inventory control, personnel Management, Business Operation & criteria for exports</p>

					Min and Surumi production, Canning of oil sardine, Tuna and prawn, Fish sausages and kneaded products, Fish protein concentrates, Marine oils and Fish meals, Marine algal products, Utilisation of fish byproducts ó fish maws, fish oils, shark skin leather, fish glue, bache-de-mer, chitosen from prawn waste and squilla, idian standard for fish and fishery products.	
64		Onboard practical on Navigational Aspects and Fisheries Navigational lights, sound signals	System of marine diesel engine Fuel system - Cooling system - Starting system - Lubrication system Understanding the systems and its accessories	- do -	- do -	- do -
65		- do -	System of marine diesel engine Fuel system- Fuel pump, Fuel Injector, Fuel consumption ó Sketching of Schematic diagram - Cooling system - Starting system - Lubrication system	- do -	Elementary Acoustics Sound waves and propagation of sound, Velocity, wavelength, reflection, echo, ultrasound, range, measuring distance by sound	- do -

			- DO -	- do -	Fish finding equipments Principle of Echo sounding, Block diagram of echo sounder, operation, main parts of echo sounder	Case studies and projects preparation
67		- do -	System of marine diesel engine Fuel system - Cooling system - Starting system ó Starter motor & engine starting system - Lubrication system	To convert compass course to true course and vice-versa. To plot a course between given positions and to measure the distance between them. To find the compass course to steer by allowing or counteraction current and leeway. To find the set and drift experienced during a passage and then to counteract the actual current experienced.	Fish finding equipments Echo sounder - controls, video echo sounders and features, SONAR, NET SONDE, and GPS ó Demonstration of equipments	- do -
68		- do -	System of marine diesel engine Fuel system - Cooling system - Starting system - Lubrication system	- do -	- do -	- do -

					Part E GENERAL ENGLISH & APPLIED MATHEMATICS (Evaluation weightage:10%)	
69		- do -	System of marine diesel engine Free hand sketching of schematic diagram of all systems. Understanding the systems and its accessories Field visit for acquainting with the system	- do -	GENERAL ENGLISH Basic Grammar Parts of speech ó noun, subjective	Part E Information Technology Introduction a)Date and information ó Definitions ó Difference between information and Date ó Information Technology (IT) and the importance of IT in to day's life. - Need of information in Business Management - Need of information in Decision Making b) Over view of IT c) Use of phone, Mobile, satellite telephone, TV, VCR, Computer, E-Mail, Fax etc.
70		Onboard practical on Navigational Aspects and Fisheries Anchoring procedures and anchor watch	- DO -	- do -	pronoun, verb, adverb, preposition, conjunction and interjection	- do -

			Engine handling Operation - Preparation for starting - Watch keeping the running - Precaution for stopping - Maintenance - Scheduled maintenance - Preventive maintenance - Break down maintenance	- do -	definition and examples of Tense ó uses of tenses	- do -
72		- do -	Engine handling Starting procedure, watch keeping and overhauling	- do -	Kinds of sentences Simple, complex, compound	Various fields of activity and their utilization a) Application of computer in Day to Day life i) Business ii) Office iii) Scientific iv) Education v) Engineering vi) Ticketing vii) Hotel viii) Medicine ix) Military etc.
73		- do -	- DO -	- do -	assertive, interrogative, imperative, negative & exclamatory sentences	- do -
74		- do -	Power Development Power - IHP - BHP - FHP - SHP - EHP - Power rating ó Calculation of Efficiency ó Calculation of power Dry docking	To fix the vessel's position by method and to this convert radio bearing to mercator bearing. To fix the vessel's position by running fix	Transformation of sentences Active voice ó passive voice	- do -

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			<p>procedures</p> <p>Dry docking procedure ó preparation before docking and undocking ó preparation of defect list ó safety procedure for entering and working in confined spaces / cleaning etc</p>	<p>method with or without current. To fix the position with the help of position lines and circles.</p>		
75		- do -	- DO -	- do -	Degrees of comparison	<p>Development of Computers</p> <p>a) History ó First generation computers, second, third, fourth</p> <p>Type of Computers</p> <p>i) Super Computers</p> <p>ii) Main Frame Computers</p> <p>iii) Mini computer</p> <p>iv) Micro (Home Computer, Personal Computer, Laptop Portable Computers)</p> <p>v) Personal computer (P.C)</p> <p>vi) Stand alone</p> <p>vii) Intelligent Terminal</p> <p>viii) Dumb Terminal</p> <p>xi) Their usage and limitations</p>

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		Navigation Aspects and Fisheries International collision regulations Marine pollution	dry docking procedures Field visit and on board training in dry dock	- do -	Transformation of sentences in part II	- do -
77		- do -	- DO -	- do -	- do -	- do -
78		- do -	Power Transmission Gear Box - Intermediate shaft - Stern tube - Propeller	- do -	Direct speech	Components of a Computer CPU Memory (Primary and secondary) Auxiliary storage Devices i) Magnetic Tape ii) Magnetic Disks iii) Compact Disk
79		- do -	- DO -	- do -	Indirect speech	- do -
			Part D NAVAL ARCHITECTURE AND SHIP CONSTRUCTION (Evaluation weightage:10%)			
80		Onboard practical on Navigation Aspects and Fisheries Operation Navigational equipments and communication equipments Fishing gear operation and maintenance	Hydrostatics Density ó Relative density ó pressure exerted by a liquid ó load on an immersed plane ó centre of pressure ó load diagram ó sheering force on bulkhead stiffeners	To fix the position by three point method and to find the course to steer by right ahead method. To plot the various courses during the passage, to find the total distance and to find the time taken to reach the destination.	Comprehension	- do -

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		<p>fishing Various fishing technique followed during fishing operation, operation</p>	<p>calculation on hydro pressure, load etc. SHIP CONSTRUCTION Stresses in ship structure Longitudinal bending in still water and waves ó transverse bending ó stresses when docking ó pounding ó panting Fore end arrangements Stem plating ó anchor ó cable arrangement ó free hand sketch Behaviour of vessel at sea</p>			
81		- do -	- DO -	- do -	Letter writing	<p>Input Devices i) Key Board ii) Mouse iii) Joystick iv) Light pen. Out put Devices Printers (impact and non- impact printers Visual Display unit (VDU)</p>
82		- do -	<p>Displacement, TPC, coefficients of form Archimedes principle – displacement – tonne per cm immersion – coefficient of form - Calculation of displacement, TPC, coefficient, W.S.A etc.</p>	- do -	Precise writing	- do -

			<p>HIP</p> <p>CONSTRUCTION</p> <p>Bottom and side framing</p> <p>Double bottom ó internal structure ó side framing ó tank side bracket ó beam knees ó web frames ó free hand sketch</p>			
83		<p>Onboard practical on Navigational Aspects and Fisheries</p> <p>Operation Navigational equipments and communication equipments</p> <p>Fishing gear operation and maintenance</p> <p>Safety precaution while fishing</p> <p>Various fishing technique followed during fishing operation, operation</p>	<p>Displacement, TPC, coefficients of form</p> <p>Marine corrosion - wetted surface area ó similar figures ó shearing force and bending moment</p> <p>Centre of gravity</p> <p>Centre of gravity ó effect of addition of mass ó effect of movement of mass ó effect of suspended mass</p> <p>SHIP</p> <p>CONSTRUCTION</p> <p>Shell and decks</p> <p>Shell plating ó bulwarks ó deck plating ó beams ó deck girders and pillars discontinuities ó hatches ó hatch corners ó free hand sketch</p>	- do -	General essays practice	- do -

			- DO -	- do -	Communicative English	Date communications and computer net work ata types, sharing of Data, sharing of resources, communication paths, satellites, cables, Microwave system and High frequency waves, LAN, WAN etc. and internet.
85		Onboard practical training, demonstration trips to impart training on fishing technique.	Stability of ships Statical stability at small angles of heel ó calculation of BM ó metacentric diagram ó inclining experiment ó free surface effect ó stability of large angles of heel SHIP CONSTRUCTION Bulk heads Water tight bulk head ó water tight doors ó non-water tight ó bulkhead ó free hand sketch	- do -	APPLIED MATHEMATICS Arithmetic Simple problems on the first four rules	- do -
86		- do -	Stability of ships stability of a wall-sided vessel Introduction to fishing crafts Boat Building materials Steel, Fibre glass, other composite materials,	- do -	Fractions	Operation systems Difference between operating system Common commands of MS ó DOS, WINDOWS How do we interact with the computer?

			ood, Characteristics of Boat Building timbers Terms in boat building General descriptions SHIP CONSTRUCTION Aft end arrangements Transom stern ó stern frame and rudder ó ship tunnel - Kort nozzle ó fixed pitch propeller ó variable pitch propeller ó free hand sketch			Hardware System ó Application ó user
87		SEAMANSHIP & NAVIGATION VIVA VOCE To read, understand and make use of a barometer and thermometer. The instruments supplied by the Meteorological office will be taken as standard. To use an azimuth mirror, pelorus (bearing plate) or other instrument for taking bearing To use a sextant for taking vertical and horizontal angles, to read a sextant both on and off the arc, to correct a sextant into which has been introduced one of more errors of	- DO -	To find the height of tide or time of tide using Indian tide tables. To prepare a comprehensive details with the help of chart abbreviation book.	Decimals	- do -

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		<p>index: to find the index error of a sextant</p> <p>The rigging of fishing vessels, methods of ascertaining proof and safe-working loads of ropes including synthetic fibre and wire ropes with and without certificates of proof loads. Rigging purchases and a knowledge of the power gained their use.</p> <p>Knots, hitches and bands in common use. Seizing, rackings, rope and chain stoppers. Splicing plated and multi-strand mainla and synthetic fibre rope and wire rope with strict reference to current practice. Slinging a stage, rigging and bosunø chair and pilot ladder.</p>				
88		- do -	<p>Importance of lofting in boat building</p> <p>Construction</p> <p>Backbone assembly</p> <p>Building stock, making the moulds, Rabbet</p> <p>building of wood- free hand sketch</p>	- do -	The Unitary method	- do -

			<p>HIP CONSTRUCTION FISH HOLD Insulated fish hold.</p>			
89		<p>Marking and use of ordinary lead lines. Preparations of getting under way. Duties prior to proceeding to sea, making harbour, berthing alongside quays, jetties, or other ships and securing to buoys. Helm orders, conning the fishing vessel. Effects of propellers on the steering of a fishing vessel. Stopping, going astern knowledge of manoeuvring capabilities of fishing vessels including turning circles, stopping distances etc. effects of wind and currents on handling of fishing vessels. Turning o fishing vessel short round. Emergency manoeuvres. Bringing a fishing vessel to single anchor in an urgency. Man overboard.</p>	<p>Importance of lofting in boat building Construction Hull planking - different types Framing and longitudinal Deck beams and carlings Knees, Riders and pointer SHIP CONSTRUCTION Reading drawing on various constructional stages of a ship ó free hand sketch</p>	- do -	Time and distance	Programming language and Multimedia applications
90		- do -	- DO -	- do -	Square root	- do -

	<p>keeping officer at sea, at anchor and at open roads. Anchors and cables: their use and stowage Knowledge of the use of all deck appliances including emergency steering gear Use and upkeep of sounding appliances, use and care of light and sound, signalling equipment including pyrotechnic light The use and care of life-saving appliances including handling characteristic, construction and stowage of life-rafts. Emergency signal, abandon ship signal, bending setting and taking in life boat sails, management of boats under oars, sails, power and in heavy weather, recovering boats at sea. Beaching or landing. Survival procedure in life-boats and life rafts. The use and care of rocket and</p>	<p>Importance of lofting in boat building Construction Hull planking - different types Framing and longitudinal Deck beams and carlings Knees, Riders and pointer Deck planking Floor timbers and Engine bearers Stern tube arrangements, Bulkhead</p>	<p>- do -</p>	<p>Logarithm</p>	<p>Utility - Security, virus, future of computer ó trends in 21st Century what is artificial Intelligence.</p>
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92		- do -	- DO -	- do -	Mensuration Area of 2 dimensional plane figures Three dimensional solids ó Volume, Lateral surface area and Total surface area ó cube, cuboid, cylinder, cone and sphere	- do -
93		The use and care of fire appliance including the smoke helmet, emergency fire pump and self ócontained breathing apparatus Action to be taken on discovering a fire ó in port ó at sea Knowledge of the precautions to be observed to prevent pollution of the marine environment Distress and pilot signals, penalties for misuse. International life-saving signals A knowledge of the contents of -Merchant Shipping Noticesø and -Notices to Marinersø The use of Notices to Mariners and Merchant	Caulking and stopping Wheel house and other superstructures, rigging Sheathing Underwater fittings Painting and varnishes	Refer the nautical publications and make a record for each one them.	- do -	Part F Maritime Law and Conventions Merchant shipping act Marine pollution

		<p>manual (MERSAR) The IALA system of buoyage. Precautions while using floating navigational aids. E.g. buoys, light vessel etc. The examiner may ask the candidate questions arising out of the written work. if it is deemed necessary on account of weakness shown by the candidate.</p>				
94		- do -	- DO -	- do -	<p>Algebra Quadratic equations Simultaneous equations Problems on equations</p>	- do -
95		A full knowledge of the content and application of the Collision Regulations	Engine installation, alignment	- do -	<p>Trigonometry Trigonometrical ratios Compound angles Multiple and sub-multiple angles Product formula and identities Heights and distances</p>	- do -
96		Report on Onboard Training ó Navigational Aspects and Fisheries	Tanks and plumbing work Deck fittings Local visit to fishing harbour	- do -	- do -	Marine Ecology & environment International conventions - SOLAS, MARPOL, STCW, ILO Conventions
97		- do -	- do -	- do -	<p>Describing motion Definition of Speed,</p>	- do -

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					velocity and acceleration Different formula on speed, velocity and acceleration Different problems on speed, velocity and acceleration		
98		Revision	- DO -				
99		MODEL EXAMINATIONS					
100							
101		Revision					
102		Revision					
103		TRADE TESTS					
104							

**PER UNIT OF 16 TRAINEES FOR VESSEL
NAVIGATOR COURSE**

A. Equipments – Navigation and Craft & Gear

Sl.No.	Name of the equipment	Quantity
1	Motor Vessel of length not less than 25 m and BHP not less than 500	1 no.

B. Equipments – Nautical Science

Sl.No.	Name of the equipment	Quantity
1	Sextant	2 Nos.
2	Parallel scales	18 Nos.
3	Pelorus	2 Nos.
4	Azimuth mirrors	1 No.
5	Magnetic compass	1 No.
6	Binocular	1 No.
7	Telescope	1 No.
8	Self igniting light	1 No.
9	Magnetic board for ROR	1 No.
10	Patent log	1 No.
11	Small Admiralty stock anchor	1 No.
12	Mast head light, side lights	1 set
13	Diving set	1 No.
14	Jet nozzle & coupling	1 No.
15	Hydrostatic release gear unit	1 No.
16	Inflatable life jackets	1 No.
17	Block models	1 Set
18	Anemometer	1 No.
19	Rule of the Road . display board	1 No.
20	DCP . extinguisher	1 No.
21	AFFF . 9 lts % ₀₀	1 No.
22	CO ₂ . Water type extinguisher	1 No.
23	AFFF 50 lts. % ₀₀ % ₀₀	1 No.
24	Lifebuoy	2 Nos.
25	Life jackets	2 Nos.
26	Life rafts for demonstration purpose	1 No.
27	Navigational charts of East & West coast of India	20 Nos.
28	Chart tables	16 Nos.
29	Instructional charts 5059, 5060, 5061 and 5062	20 Nos. each
30	Various display boards for position fixing and signals.	5 nos.
31	EPIRB	1 No.

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		1 No.
	apparatus	1 No.
34	International shore connection	1 No.
35	Chronometer	1 No.
36	GPS (2 channel)	1 No.

C. Equipments – Craft & Gear

Sl.No.	Name of the equipment	Quantity
1.	Adjustable net making stand provided with cup hooks.	1 set
2.	Different type of live models in glass showcase. Live models representing stern trawling operation, side trawling operation, outrigger trawling operation, multi-rig trawl operation, Bull or pair trawl operation (all bottom trawling operations) Gill net operation, purse-seine net operation, long line operation and Mid water trawling operation.	1 set
3.	A live model of purse-seine net with facilities to operational technique such as pursing the net as in original operation.	1 set
4.	A live model trawl net fixed with T.E.D. (Turtle Excluder Device)	1 set
5.	Live model nets of different type of trawl nets like two seam trawl, four seam trawl, multi seam trawl and rope trawl. Different sizes of live model of gill nets and purse-seine nets.	1 set
6.	Different type of live model of Otter boards like flat rectangular wooden otter board, oval otter board, " V " shape otter board (steel) Hydrofoil otter boards etc.	1 set
7.	One unit of Tuna long line gear with all accessories like float, float line, main line, branch line, snap clip, swivel, sekiyama, snood wire and tuna hook.	1 set
8.	Different type of fishing hooks like mustad tuna hooks, shark hooks, kalava hooks etc.	1 set
9.	Samples of different type of twines and ropes like P.P. rope, P.E. rope, HDPE ropes, PE twines, HDPE twines, Nylon twines with different specifications.	1 set
10.	Display boards showing	
	a. Modern classification of fishing gear and indigenous fishing gear.	1 set
	b. Classification of fishing gear materials and accessories.	1 set
	c. Display showing " Tailoring " like point cut, bar cut, mesh cut or "T" cut etc.	1 set
	d. Display showing "baiting " "creasing " and Fly mesh etc.,	1 set
	e. Display showing different type of mountings, splicing like eye splice, long splice, short splice etc.	1 set
11.	Twine twister machines.	1 set
12.	Twine wounding spool.	1 set
13.	Live models of fish trap, lobster trap, Fyke Nets	1 set each
14.	Spotters like artificial jigs, "G" link assembly, "D" shackle, Swivels, different type of sinkers, different type of floats like aluminium, glass, rubber, sponge corks, sponge corks, PVC floats etc.	1 set
15.	Different type of net making needles and mesh gauges.	1 set