

EX/ MRWF 33074 ANTI SUB MARINE WARFARE

(70 Periods – 53 Hrs)

Max Marks 100

Pass Marks 50

Type of Exam – Written

Duration – 03 Hrs

<u>PERIOD</u>	<u>TOPIC</u>
01 – 02	Introduction to ASW
03 - 06	Current trends in ASW -Submarine Navies and ongoing trend -Submarine Air carriers – (Western & Chinese concept models)
07-11	Submarine employment, offensive operations, defensive sub operations, sub shallow water operations, sub operational principles, submarine operating procedure, likely actions on detection by surface forces, popular myths about submarines, sub rescue vehicles
12	Unconventional type Under Water Craft (Ex LTTE) -Human torpedo -Dummy submersible craft
13	SLN countermeasures against Ex LTTE UW craft -Tactics used by Fleet units -Tactics used by Harbour Defence units
14	Introduction and application of Under Water Acoustics (UWA) in ASW
15	Use of sound in ASW and its purposes
16-17	Speed of sound, Factors affecting sound speed – Temperature, Salinity and Depth
18	Sound speed gradient – Positive, Negative & Iso-Thermal
19-20	Typical deep sea temperature & velocity profile (Surface, Thermo Cline, Main Thermo Cline & Deep Iso - Thermal)
21	Common sound propagation paths (Surface Duct, Shallow Sound, Deep Sound and Convergence)
22	Propagation lost - spreading: absorption, scattering

- 23 Introduction to SONAR, prime role of SONAR, Principle function of SONAR
- 24 Typical naval SONAR platforms
- 25 Types of Transducer Elements (Piezo Electric, Magneto Strictive, Electro Strictive)
- 26-27 Noise & Reverberation
 -Sea noise (Geophysical, traffic, surface, thermal, biological)
 -Self noise – radiated, self, propeller, hydrodynamic, machinery
 -Reverberation
- 28 Basic SONAR equation and SONAR parameters
- 29 Introduction to:
 - KODEN 184
 - CERBERUS
 - SONAR 184 S/P
- 30 Introduction to LOFAR
- 31 Types of Sonar Buoys, its advantages, disadvantages, composition and basic operation
- 32 XBT: Its general description, probe, launcher recorder
- 33-34 RBU6000: Introduction, platforms use, basic specifications, modes of loading, RGB60, launcher & main parts, safety precautions when firing
- 35-36 Torpedo Mk 46: Introduction, history, capabilities, limitations, construction, nose, warhead & fuse, basic operating procedure, operation sequence – pre launch, launch, search, and attack phases
- 37-38 Torpedo A244S: Introduction, history, capabilities, limitations, construction, nose, warhead & fuse, basic operating procedure, operation sequence – pre launch, launch, search, and attack phases
- 39-40 Depth Charger Mk 11: Introduction, basic specifications, components & function, basic operating procedure, safety precautions
- 41 Modern trends in under water weapons, “Shkval” super cavitations torpedo, specifications, capabilities & limitations
- 42 Introduction to mine warfare& mine counter measures, object of MW

- 43 Types of mine fields – attrition, closure, nuisance, anti sub, dummy, countered & un-counterred.
- 44 Types of mining operations – offensive, defensive, strategic, tactical.
- 45 Mine laying techniques.
- 46 International Law’s in Mine warfare.
- 47 Ex LTTE Sea Mines
 - Kittu Sea mine – Introduction, components, operating procedure
 - Nayaru Sea mine – Introduction, components, operating procedure
 - Limpet mine – Introduction, basic components, operating procedure
- 48 Mine counter measures: Introduction & Aim
- 49-50 Types of MCM operations: Reconnaissance, Exploratory, Clearance, Limited, Short Term, Attrition, Precursor, and Check
- 51 Introduction to Oropesa, Team, Antenna, Sag line, Bottom & Net sweeps.
- 52 Stages of Mine Hunting, and types of mine hunting – Acoustic, Optical & Magnetic
- 53 Modern MCM: ALMDS, RAMICS & Marine mammals, Mine hunting and ROV’s
- 54 Introduction to Harbour Defence and typical HD plan
- 55 Method of detection: visual, RADAR, loops, boom net, patrol craft
- 56 Operation Awkward I, II & III
- 57-61 SLN experience in HD – Case studies
 - Colombo harbour & surface attacks by Ex LTTE
 - Trincomalee harbour – Air attacks by Japanese in World War II
 - KKS harbour – under water attack by EX- LTTE frogmen
- 62-67 SLN counter measures adopted by Command HD organizations during recently concluded ethnic conflict
 - Seaward defence actions, landward defence & air defence actions
 - Nets, booms, use of hydrophones, HD SONARS, Explosive charges, patrols

68-70

Case studies/Assignments

- Sinking of Argentine Navy ship General Belgrano by HMS Conqueror (Falkland War)
- Sinking of INS Khukri by submarine PNS Hangor (Indo-Pak war 1971)