

Syllabus of Excavation Discipline

Basic and working knowledge of principles & operation with full knowledge on maintenance, repair and overhauling of following assemblies / sub-assemblies used in Heavy Earth Moving Machinery (HEMM)

1. Internal Combustion Engine :

Difference & application of S.I. and C.I. Engines, Combustion Process in C.I. Engines.
Cylinder Arrangement, Firing Order, Fuel Injection, Fuel Consumption.
Performance, Mechanical Efficiency & Output (Horse Power- IHP & BHP).
System of Low & High Pressure Super Charging, Turbo Charging.
Cooling, Exhaust & Lubrication System of C.I. Engines.
Daily /Periodical Maintenance Methods of C.I. Engines, Applicable In HEMM

2. Gear Box:

Type and Functions Of Gear Box.
Difference between Gear Box And Torqmatic Transmissions
Operational Function Including Control System & Utility Of Torqmatic
Transmissions with Mechanical, Electro-Mechanical And Electronic Controls
Daily/Periodical Maintenance Methods of Gear Box & Torqmatic Transmissions in HEMM.

3. Differential / Final Drives:

Methods & operation and propagation of power through Differential/Final Drives.

4. Clutch System:

Types of Clutch System - Mechanical, Hydraulic or pneumatically assisted.
Function & Method / operational principal of different type of Clutch System.

5. Brake System:

Type & application of different types of Brakes available in HEMM - Air over hydraulic or pneumatic or disc type.
Function & Method / operation of different Brake System and its Daily / Periodical maintenance method.

6. Steering / propel System:

Working of different steering / propel system used in HEMM - Mechanical
Hydraulic assisted and Electric Powered.

7. Crawler Drive:

Operation of Crawler mechanism, Track chain, Sprocket idlers, track / carrier rollers and their maintenance
Method of track tensioning arrangement etc.

8. Tyres:

Off the Road Tyres (OTR) - Types & Sizes of OTR tyres used in HEMM
Types of failure of tyres & its possible reasons
Checking & maintenance of Off the Road Tyre
Tyre handling equipment- Operation & use of Tyre handling equipment.
Re-treading- Type & methods of re-treading pertaining to Off the Road Tyre.

9. Air Compressors:

Functional difference & Application of reciprocating rotary, screw type compressing different HEMM

10. Hydraulic System:

Working of Hydraulic System in different HEMM including hydraulic pump, motor, cylinder, Valve and their maintenance.

11. Hoist/Swing/Propel Systems in Excavator/Draglines:

Function & Working of Hoist / Swing / Propel Systems in Excavators/Dragline.

Daily/Periodical maintenance methods of Hoist / Swing / Propel Systems in Excavators / Dragline.

12. Crowd System in Excavators:

Function & Working of Crowd System in Excavator.

Daily / Periodical maintenance methods of Crowd System in Excavators

13. Drag System in Backhoe, Draglines:

Function & Working of Drag System in Hyd.Backhoe shovels, Draglines

Daily / Periodical maintenance methods of Drag System in Hyd.Backhoe, Draglines

14. Rotary and Feed System in Blast hole Drills:

Operation & Working of Blast Hole Drills.

Capacity and sizes of Blast Hole drills in use in Open cast Mines of CIL Function of Rotary, feed and dust suppression system

Drill Rod sizes used in Open Cast Mines of CIL, its application and construction in relation to the different drill machines.

Daily /Daily /Periodical maintenance methods of Rotary Blast Hole Drills

15. Drill Bits:

Different types & Sizes of Drill bits used in Open Cast Mines of CIL.

16. Lubricants:

Function properties and application of different type and grades of Lubricants and Grease used in HEMM.

17. Wire Rope:

Construction, sizes with length of Wire Ropes required for different application in Draglines and Rope shovels in use in CIL.

18. Welding Equipment:

Type of Welding equipment's and their application

Type of Electrodes and Various Welding & Cutting Technologies.

19. Workshop Equipment:

Application of various service tools like Pneumatic Wrenches, Torque Wrenches, Torque Multipliers, Hydraulic Mechanical Jacks, Machine Tools, Washing & Lubrication Equipment, Lifting Tools (Chain Pulley Block, EOT Cranes, Forklift Truck) & tackles, Bearing Puller etc.

20. Mobile Cranes:

Tyre & Crawler Mounted Cranes and their application.

21. Auto Electricals:

Different Auto Electric components used in HEMM - their application & maintenance.
Batteries- Rating, application and maintenance in reference to HEMM

22. Measuring & Monitoring Instruments:

Different measuring & monitoring instruments used for HEMM and their application for both Mechanical & Electrical Systems.

23. Electric Prime Movers:

Principles of Electrical Prime Movers - LT, MT & HT.

Function & Working of Alternators, Generators, Squirrel cage/induction motors, Synchronous motors used in HEMM

Type & Class of Insulation

Daily / Periodical maintenance methods

24. AC/DC Control System:

Type of Control System. Including ward-Leonard control etc. Thyristor and other electronic controls.

25. Transformers, Relays etc.

Types & Function of Transformers Relays.

Components of Transformer

Losses & efficiency

26. Armoured / Trailing cables:

Type & application in opencast mines/equipment. Type & class of insulation

Cable - jointing sets.

27. Field Switches - with ACB, OCB and VCBs and their maintenance

28. Maintenance & monitoring of statistical data relating to Equipment performance & Production

29. DGMS Mining Rules & Regulations related to OC Mines

30. Open Cast Mine Planning - Basic Knowledge

31. General Knowledge on Technical Parameters - of the Earth moving Equipment deployed in CIL Mines- Equipment wise

32. Knowledge on deployment of HEMM in the Mines for optimum utilization

33. Basic Knowledge of Haul Road/Dump Road – Planning Construction and Maintenance

34. Safety aspects in Mining operation in respect of DGMS guide lines for different HEMM