Roll No.

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV/DEC 2024

MINING ENGINEERING
Fifth Semester
MI5501 – SURFACE MINING
(Regulation 2019)

Time:3 hrs

Max. Marks: 100

CO1 To understand various modes of opening up of deposits amenable to surface mining.
CO2 To plan and design the basic components of a typical surface mine including benches and haulroads according to the deposit formation.
CO3 To identify the salient points that dictate which is the safest, most efficient, and most versatile extraction method to employ classify and select the suitable surface mining methods and equipment based on site conditions.
CO4 To understand the concept of waste dump formations and slope failures in surface mines.
CO5 To discuss the impacts that social and environmental issues have on surface mining from the pre-exploration phase to end-of-mine issues, and how to manage these two increasingly important factors to the benefit of both the mining company and the society.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)

(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	Mention any four safety features associated with the construction of haulroad of a large surface coal mine.	2	CO1	L2
2	Write a short note on cyclic and non-cyclic mining system adopted in surface mining with examples.	2	CO1	L1
3	Find out the volume of material per meter of slope length of a face (m^3/ m) when the pit slope angle is increased from 25^0 to 30^0 for a depth of 300 m in an open pit mine.	2	CO2	L3
4	Spell out the basis to be considered legally and technically for the selection of height, width and slope of a stone quarry.	2	CO2	L5
5	Enumerate any four merits and demerits of square/rectangular blasthole pattern adopted in the surface mine blasting.	2	CO3	L1
6	Determine the **'toe burden'** for a 12 m bench with a crest burden of 1.5 m, face sloping at 20^0.	2	CO3	L3
7	What do you understand by the term - 'radial casting'?	2	CO4	L6
8	Determine the production capacity of a shovel (in tonne per hour), if the capacity of the bucket is 9.5 m^3. The average time cycle is found to be 45 second. The bucket fill factor is 0.80 and the specific gravity of the bulk material is 1.50. The shovel effective loading hour utilisation is 50 percent.	2	CO4	L3
9	What do you mean by 'windrowing'?	2	CO5	L2
10	Specify any four significant parameters to be considered in selection of equipment system for excavation and transport in a surface mine?	2	CO5	L1

PART- B (5x 13=65Marks)

Q.No	Questions	Marks	CO	BL
11 (a)	(i) Explain briefly the process involved in selecting an appropriate choice between 'Surface' and 'Underground' mining.	6	CO1	L1
	(ii) Discuss the scope of Surface Mining in the current scenario of the country. Enumerate the parameters affecting the choice of opencast mining methods.	7	CO1	L1
	OR			
11 (b)	Draw a layout for an open pit mine producing copper with an output of 5000 t per shift in a vein deposit of 15 m thickness located 25 m from the surface with a stripping ratio of 1:4.0. The deposit is existing with dip angle of **65°**and the strike length of the same is 2.4 km. The overburden consists of massive granitoids covered with top soil of 3 m thickness. With the help of suitable sketch(es), explain the sequence of development, cycle of operations with necessary equipments, applicability, advantages, and limitations of the aforesaid open pit mine, in detail. Assume other conditions as applicable with providing justifications.	13	CO1	L2
12 (a)	Enumerate the various factors influencing slope failures in surface mines. Discuss the different type of slope failures with neat sketches and enlist the various slope failure warning signs. Briefly narrate the slope monitoring mechanism for deep open pit mines.	13	CO2	L2
	OR			
12 (b)	Discuss the different types of stripping ratio used in surface mines with its importance. Enlist the basic data to be complied for a surface mine planning.	13	CO2	L2
13 (a)	An open pit copper mine is proposed to be opened in a highly eco-sensitive forest area with a production capacity of **3 Million Tonnes per annum** with a **stripping ratio of 4.0 m^3/t**. The rock conditions are found to be **Hard formation**. The Electric Rope shovel of **10 m^3 bucket capacity** is proposed for both overburden & ore benches and the proposed **bench height** for all the formations is **12 m**. The proposed open pit mine is to be operated in **3 shifts**. Determine the **total number of drilling machines are required for the proposed project**. Assume other conditions wherever necessary and give suitable justifications. Only S.I units to be used.	13	CO3	L3
	OR			
13 (b)	(i) Explain the **principle of rock breakers** used in the quarries with a neat schematic diagram and **spell out the factors** to be considered for improving the productivity of the rock breakers.	6	CO3	L3
	(ii) Enlist the **selection considerations** while choosing the crawler or tyre mounted dozers. Give an account of **different type of dozers** used in mining based on the type of blades used.	7		
14 (a)	Prepare a statement of heavy earth moving machinery required for an open pit iron ore mine to be worked by shovel-dumper combination to produce 6.0 MT of iron ore / year with an average stripping ratio of 0.3 tonne / tonne. The mine will be worked with a bench height of 12 m. The haul distance (one way) for both ore and waste dump is **1km**. Assume any other data necessary and mention them.	13	CO4	L4

OR

14 (b)	(i) Determine the bucket capacity of a dragline deployed in an opencast coal mine producing 5 MT of coal / year with an average stripping ratio of 2.8 m^3/t from the coal seam of 10 m thickness. Assume any other data necessary and mention them with justifications.	9	CO4	L4
	(ii) Enumerate any **four significant factors** used to select the Bucket Wheel Excavators (BWE) for the surface mining operations and mention any four merits & demerits of BWE.	4		
15 (a)	(i) Explain briefly the **various types of in-pit crusher technology** with neat schematic diagrams. Enlist any four merits & demerits of in-pit crusher technology.	9	CO5	L5
	(ii) Briefly explain the **various procedural steps** involved while shifting the belt conveyor system in an opencast lignite mine.	4		

OR

15 (b)	You are a Mines Manager of an open pit copper mine producing 2 million tonnes of copper per annum with a stripping ratio of 1:4.5 through shovel-dumper combination system, **spell out the parameters** to be considered for identifying the suitable site to construct waste dumps and **describe the suitable methodology** for designing and formation of the waste dump with neat sketches. Also, **specify the stabilisation measures** for the above waste dumps.	6 7	CO5	L5

PART- C (1x 15=15Marks)
(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	As a blasting engineer of an open cast coal mine located at a distance of 1.0 km from a village, producing 10 million tonnes of coal per annum with a stripping ratio of 1:3.5, you will have to fragment the over burden comprising of sandstone for the efficient operation of Dragline of having the bucket capacity of 24 m^3, deployed in 30 m bench in **medium hard** formation. Design the ***controlled blast*** parameters with neat sketches - (i) Burden (m) (ii) Spacing (m) (iii) Stemming (m) (iv) Sub-drilling (m) (v) Charge factor (kg/m^3) (vi) Explosives and initiation system (vii) Decking, if any (viii) Powder factor (T/kg) (ix) Initiation pattern (x) Initiation sequence. Assume and justify other conditions wherever necessary.	15	CO3	L4

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