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18MN642

**Sixth Semester B.E. Degree Examination, July/August 2022**

## Surface Mine Planning and Design

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. With the help of suitable sketches, describe the polygonal method (based on the use of horizontal section) of ore reserve estimation. (10 Marks)
- b. Estimate the grade at point G using inverse distance weighting method (Case 1) and inverse distance square weighting (case 2) from the details given below :

Point	A	B	C	D	E	F
Grade at point (%)	0.64	0.40	1.37	0.26	0.20	0.45
Distance from the point G (m)	78	45	63	50	75	65

(10 Marks)

**OR**

- 2 a. i) How does ore zone compositing differ from bench compositing?
- ii) What is Taylor's Mine life rule and find out the realistic range of mine life if the available recoverable ore is 500 million tones? (10 Marks)
- b. Find out the ore zone and bench composite assay values for an exploratory borehole from the details given below :

COLLAR LEVEL PIT BOTTOM – 250m BENCH HEIGHT – 12m

Depth	FROM	-	5	9	14	20	28	35	44	50
From surface (m)	TO	5	9	14	20	28	35	44	50	55
Assay value (%)		0	0.18	0.20	0.25	0.33	0.35	0.21	0.44	0.15

(10 Marks)

### Module-2

- 3 a. According to the geological report, about IX seams of coal deposit is present. Estimated resource of coal deposit is about 131MT. As suggested by the geologist, extraction of deposit from seam IX to seam VI should be carried out by surface mining while the remaining seams is to be extracted by underground method. Estimated resource and reserve from seam IX to seam VI is found to be 3MT and 2MT. As a mine planner and design engineer which method do you suggest for economically profitable mining. Explain in detail the steps involved for the same considering the stripping ratio. (10 Marks)
- b. Calculate BESR and LSR for a coal deposit from the following data :
  - i) Selling price of coal – Rs 3500 per te.
  - ii) Coal production and processing cost – Rs 1100 per te (by surface mining).
  - iii) Coal production and processing cost – Rs 2200 per te (by underground mining).
  - iv) Overburden excavation cost – Rs 550 per m<sup>3</sup>. (10 Marks)

**OR**

- 4 a. Discuss the different types of stripping ratio stating their mathematical expression. (10 Marks)
- b. Draw a neat sketch of three variants of the same type of layout upto four benches for an inclined bedded deposit. (10 Marks)

**Module-3**

- 5 a. Explain the floating cone method for determination of ultimate pit configuration. Discuss the limitations of this method. Illustrate your answer with the help of suitable example. (08 Marks)
- b. The block values of 2D sections through an economic ore body are given below. Find out the optimum pit for this section and the total value of the optimum pit. Also mark the optimum pit on the original section given below : (12 Marks)

-4	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2
-2	-1	1	1	2	2	2	1	2	2	2	1	0	-1
-2	-1	1	2	0	0	1	2	2	0	0	-1	-1	-2
-2	-1	0	1	0	-1	0	3	0	0	-1	-2	-2	-2

**OR**

- 6 a. Derive an expression (from first principle) for optimum cut off grade for maximum profit considering that the concentrating rate is the governing constraint. (12 Marks)
- b. Find out the net present value of a project considering 12% discount rate for the details given below : (08 Marks)

Year	0	1	2	3	4	5	6	7	8	9
Capital Expenditure (Rs Millions)	100	200	400	-	200	-	100	-	200	-
Cash Flow (Rs Millions)	-	-	-	250	300	350	400	450	450	600

**Module-4**

- 7 a. Define the types of Highwall slopes and mark the elements of Highwall slopes, with neat sketch. (10 Marks)
- b. Explain in detail the influence of pit slope angle on mine economics with example. (10 Marks)

**OR**

- 8 a. Explain in detail the factors affecting stability of dump slopes. (10 Marks)
- b. Explain in detail the Highwall slope design methodology, with neat flowchart. (10 Marks)

**Module-5**

- 9 a. With the aid of suitable sketches, describe the Safety features of surface mine haul roads. (10 Marks)
- b. Explain in detail the factors influencing mine drainage system in surface mine. (10 Marks)

**OR**

- 10 a. With the help of flowchart, describe the procedural steps of mine closure. (10 Marks)
- b. Explain in detail the different stages of feasibility report in Mine planning and design. (10 Marks)

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