

Subject: BULK SOLIDS HANDLING (MIN – 804/3)
(Elective – II)

Time: 3 hours

Full Marks:70

FIRST HALF

Answers question no 1 and any two from the rest.

Figures on the right-hand side margin indicate full marks.

It is mandatory to answer all parts of a question in one place.

1. i) Write short notes on:

- a) Pulley Lagging
- b) In-line idlers
- c) Staggered idlers
- d) Type A spindle end without added end cap idlers

ii) Explain:

- a) Idler 133 x 1000A x 25 IS: 8598
- b) Belt Pulley 400 x 600 R IS: 8531
- c) Idler set N 133 x 1000 A x 20 IS: 8598

$$(2+2+2+2^{1/2})+(1^{1/2} \times 3) = 13$$

2. With the help of a schematic diagram describe ore handling system at zero metre level in a Copper mine. 11

3. A belt conveyor having inclination of 8.75° with the horizontal. Angle of wrap for drive pulley is 210° . Drive pulley dia. is 800 mm. Drive pulley weight is 350 Kgr. Tight side tension is 11.86 KN. Slack side tension is 6.86 KN. Belt width is 650 mm. Pulley face width is 750 mm. Bearing centers is 1150 mm. Thickness of lagging over the pulley is 15 mm.

Calculate the bending moment at hub, tensional moment at hub and shaft dia at hub of the drive pulley considering limiting deflection is 5 minutes. E for material of the shaft is 2.1×10^6 kg/sq.cm., shear force (fs) is 500 kgf/sq.cm., constant $K_B = 1.5$ and $K_T = 1$.

11

4. a) Draw a schematic flow diagram of a coal Handling Plant.
b) Briefly describe the main components and auxiliary components of a Coal Handling Plant.

7+4=11

5. a. What do you mean by 'Bulk Material'?
- b. What are the purposes of Bulk Material Handling?
- c. What are the different modes of Bulk Material handling?
- d. Define the following terms:-
- i. angle of surcharge,
 - ii. angle of repose
 - iii. flowability of bulk material.

1+2+2+(3x2)=11

SECOND HALF

Answers question no 6 and any two from the rest

**Figures on the right hand side margin indicate full marks.
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6. Write short notes on:-

- Belt conveyor drive components
- Safety switches of a belt conveyor
- Different types of pulley of a belt conveyor with vertical gravity take up.
- Belt scrapers
- Write two basic differences between belt feeder and belt conveyor.

2+2+3+4+2 =13

7. a) Classify gearbox based on thermal rating check.

- b) A foot mounted parallel shaft i.e. helical speed reducer is to be directly coupled to a 750 kW, 1500 rpm drive motor of a belt conveyor. The belt speed of the conveyor is 3.15 m/sec. Drive Pulley diameter is 800 mm. Drive pulley absorbs 720 kW on 24 hr/day Service. Maximum ambient temp. is 30°C. Consider the Mechanical Service factor is 1.5 & Thermal service factor is 0.9.

- Calculate Normal Ratio of the gearbox.
- Minimum kW for Mechanical rating checks of the gearbox.
- Minimum kW for Thermal rating checks of the gearbox.

2+ 9=11

8. Calculate the load area of a toughed belt of a belt conveyor considering:-

α = angle of surcharge, degrees

β = angle of idler, degrees

A_s = Area of surcharge.

A_b = Base trapezoidal area.

l = length of one parallel side of trapezoidal area.

l_1 = length of other parallel side of trapezoidal area.

j = height of trapezoidal area.

m = slant length of trapezoid.

r = radius of surcharge arc.

f = horizontal projection of slant side of trapezoid.

c = edge clearance, edge of material to edge of belt.

b = Belt width

$c=0.055b+ 0.9$

11

9. a) Explain: Airslide channel with a diagram.

b) Write short notes on: Stacking equipments.

c) Give one example of hydraulic transportation of bulk material in mining industry.

6+4+1=11

10. a) Write short notes on: Application of clutch in mining; Bevel Gear

b) Deduce the expression of power transmitted by belt drive considering Tight side tension is T_1 in N, Slack side tension is T_2 in N, Belt speed is v m/sec.

(3+3)+5=11