UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: MN/MC 359
COURSE NAME: MATERIALS HANDLING
CLASS: MN/MC III **TIME:** 3 HOURS

Name**:** _____Index Number: _____

ANSWER FOUR QUESTIONS ONLY
ALL QUESTIONS CARRY EQUAL MARKS

Q 1 a.

i. Mention six factors affecting the capacity of a belt conveyor system. **[6 Marks]**
ii. Explain two factors affecting the selection of belt conveyor idlers. **[4 Marks]**

b. A 320 m long inclined belt conveyor is being used to convey ore from a stockpile to the processing plant at a speed of 2.3 m/s. The belt is 1.05 m (42 inch) wide, has a capacity of 900 t/hr (992 ton/hr) and discharges material at a height 15 m above the loading point. The material being conveyed has a density of 2.1 t/m^3 (131.1 lb/ft^3). The conveyor system is being used for permanent application and has the head drive pulley lagged and an angle of wrap of 210° with automatic (counterweight) take-up. The carrying side idler spacing is 1.05 m (3.5 ft) and the return side idler spacing is 3.05 m (10 ft).

Determine the following (using the appendices of tables and formulae provided):

i. The effective tension **[5 Marks]**
ii. The tension required to minimise sagging of belt to 2%. **[2 Marks]**
iii. The maximum tension **[6 Marks]**
iv. The slack side tension **[2 Marks]**

Q 2

a. A 100 t locomotive is coupled to a train of 15 loaded cars each of weight 10 t. The locomotive is drawing this load through a curve of radius 150 m at an average acceleration of 0.12 m/s^2 down a grade of 0.5%. The rolling resistance of the locomotive and cars are 98 N/t and 196 N/t respectively. If the coefficient of adhesion between locomotive wheels and the rail is 0.27, determine the following: **[10 Marks]**

i. Tractive Effort of the locomotive
ii. Net tractive effort
iii. Curve Resistance of the train
iv. Drawbar pull

b. Write short notes on:
i. Battery locomotive **[6 Marks]**
ii. Rocker dump type of mine car (rail wagon) **[4 Marks]**

c. Mention five braking systems employed in locomotive haulage **[5 Marks]**

Q 3

a. Mention two advantages and three disadvantages of the slusher. **[5 Marks]**

b. A slusher is to be employed to handle material in a cut-and-fill stoping operation. Scraping is over a distance of 30 m at a rope speed of 84 m/min. The operating efficiency of the slusher is 0.60. The slusher is required to meet a daily production target of 1250 t. The effective operating hours per day is 14 hours.
Determine the bucket capacity (m^3) of scraper required for the slusher to meet the target if the muck density is 1.9 t/m^3. **[9 Marks]**

c.

i Mention six basic design features that make the LHD suitable for underground applications. **[6 Marks]**

ii Discuss how loading area affects the productivity of LHD's **[5 Marks]**

Q 4

a. Mention six factors affecting the selection of front-end loaders for surface mining application **[7 Marks]**

b. Describe the propel machinery and front end components of the dragline **[10 Marks]**

c. A hydraulic shovel is being used for loading an open pit mine. The operating cycle comprises digging, swinging (loaded), dumping and swinging (empty). The average times involved are: digging – 13 seconds, swinging (loaded) – 8 seconds, dumping – 5 seconds and swinging (empty) – 9 seconds. The production target per shift of 12 hours is 10,000 m^3 (bank). The percentage swell of the material being excavated is 15%. The bucket fill factor anticipated is 0.82. The availability of the shovel is estimated to be 0.80 and the utilisation is 0.88. Calculate the suitable size (volume) of bucket required to meet the production target of the loading operation. **[8 Marks]**

Q 5

a. Describe trolley assist dump truck mentioning three advantages and disadvantages associated with its application. **[9 Marks]**

b. What is usable rimpull?
A Caterpillar 773D conventional rear dump truck having a gross vehicle weight (GVW) of 92,534 kg has 65% of the gross vehicle weight on the rear drive wheels. This truck which is travelling at a speed of 15 km/hr has a flywheel power of 485 kW (650 hp) and engine efficiency of 83%. The road on which the truck is travelling has a grade resistance of 80 kg/t and a rolling resistance of 30 kg/t. If the coefficient of traction is 0.40, determine the following:

i. Available rimpull
ii. Required rimpull
iii. Usable rimpull

[10 Marks]

c. Mention six causes of dump truck waiting **[6 Marks]**

Q 6

a. Write short notes on the following:

i. Pipe conveyor **[5 Marks]**

ii. Cable conveyor **[5 Marks]**

b. Mention six applications of bulldozer **[6 Marks]**

c.

i Describe the bucket wheel excavator mentioning one application. **[5 Marks]**

ii Mention four factors affecting the selection of bucket wheel excavators **[4 Marks]**

Examiner: Assoc Prof V. A. Temeng