UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, APRIL-MAY 2014

COURSE NO : **EL 374**
COURSE NAME: **HAULAGE MACHINERY**
CLASS : **EL III** TIME: **3 HOURS**

ANSWER ALL QUESTIONS IN BOTH SECTIONS

SECTION A *[15 MARKS]*

Match some of the items in the table to their correct representative statements in questions 1 to 10.

Dynamic braking	DC injection braking	Loader	Bare wire system
Tractor	Radial system	Secondary distribution	Bulldozer
Primary distribution	Crane	Friction braking	Pantograph
Ring system	Plug-reversal braking	Dead-man cable	Excavator

1. In this braking method, connections of the motor are suddenly reversed. The motor slows down quickly to the point of reversal and is switched off at that point. Because this system introduces very high currents in the supply lines and causes excessive heating in the motor _____
2. This is equipped with wire ropes, sheaves, and a hoist to lift and move materials and supplies during construction. _____
3. This form of power distribution comprises the low-voltage network laid along the streets or over the fields and from which, service connections are tapped off to individual domestic consumers. _____
4. This collects current from the single overhead line, which, through the medium of the master controller and contactors is transmitted to two axle-hung nose-suspended traction motors, which in turn drive the axles through single-reduction spur gears. _____
5. In this braking method, induction motors are made to act as generators by feeding current into one portion of the winding and loading the other part with resistors. _____
6. This is used to loosen hard soils and shift dirt, and can work on tough terrain. _____
7. In this braking method, the supply to the motor is disconnected and direct current is fed into the stator windings, thereby producing magnetic flux which reacts to cause a braking effect. _____

8. In this interconnection system, a fault at in the lines causes a fuse to blow leaving some consumers without power supply. Repairs to the line must be carried out before the consumers get power. _____
9. This is used to dig holes, demolish buildings, and lift and load heavy supplies. _____
10. The transmission lines or interconnections terminate at large main substations from which the power is distributed to small substations scattered throughout the load area, which may be only a few square miles. The voltage may lie between 132 and 3.3 kV. _____

Choose the correct answer from the options lettered A to D.

11. Which two of these loads have active torques?

a. elevator b. lathe c. pump d. crane

12. All these are advantages of electric drives except:

a. flexible control b. simple starting c. available speed range d. available load range

13. The product of velocity and the difference in torque is a typical expression for;

a. braking torque b. load amplitude c. power d. energy

14. Disadvantages of group drives include all the following except:

a. loss in coupling alignment b. untidy and unsafe c. high power losses d. high noise

15. Which two of these loads have passive torques?

a. elevator b. lathe c. pump d. crane

16. Battery capacity in battery locomotives are exhausted due to these factors except:

a. faster speeds b. long distances c. high gradients d. heavy loads

17. The average of slack tension and tight tension gives:

a. total tension b. initial tension c. elongation tension d. contraction tension

18. Sequence switching is employed in tandem operation of conveyors owing to the following *two* reasons.

a. prevent heavy current b. avoid loading still conveyor c. avoid interlocking d. derailing

Preamble for questions 19 and 20: *Calculate the charging time for a 120 Ah battery considering an opportunity charge rate of 25 % of battery capacity.*

19. Determine the actual practical battery Ah rating: _____

20. Determine the approximate actual time needed for a complete charge. _____

Indicate whether the given statements are True or False.

21. Pulling the signal switch lever in a shaft signaling system at any station rings all other bells at the various stations.

22. In passive torque, change in load dimensions results in change in the sense of torque.

23. Active torque act in the same direction even after the direction of a drive is reversed.

24. Terminal voltage equation of a dc motor is given as $V = E - I_a R_a$

25. Wide flat conveyor belts run at high speeds.

26. Bevel gearing is extensively used where direction of motion is changed by 90°.

27. Rack and pinion coupling is used where the motor is mounted in the same plane as the machinery to be driven.

28. Multimotor drive uses separate motors to actuate different parts of a driven mechanism.

29. In telemetric principle, many cables are bound and conveyed through a single transmission channel.

30. Considering heating, chemical and other losses, a 220 Ah battery practically requires a current of 30 A for a complete charge.

SECTION B *[45 MARKS]*

Que 1 a) Draw a circuit diagram to charge 3 batteries from a three-phase supply bus bar. ***(10 marks)***

b) In the ring main distribution system shown in Fig. 3, calculate:

i) The load voltages
ii) The power developed by each load
iii) The power lost in the cable
iv) The efficiency of the system.

Take the resistance of 100 m of a single conductor to be 0.1 Ω. ***(40 marks)***

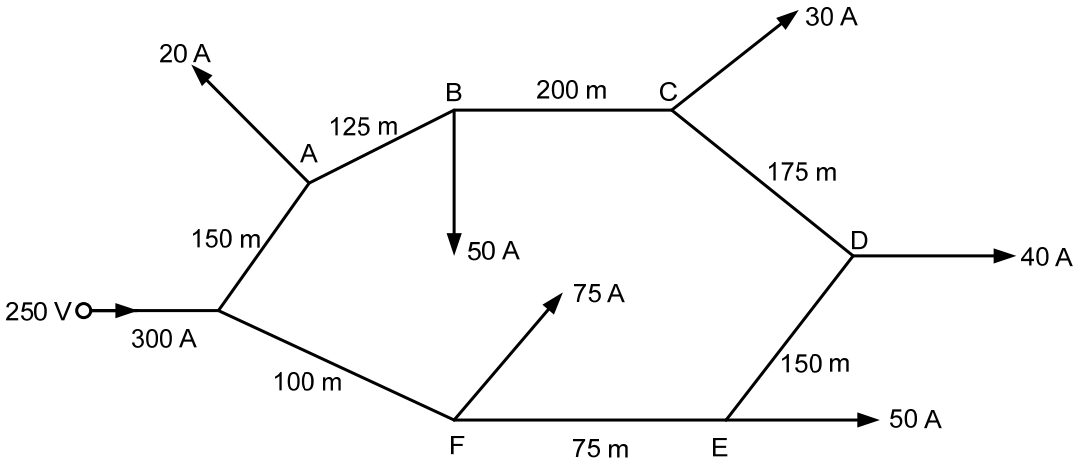

Fig. 1

Que 2 a) Draw and label a circuit diagram of the magneto switch used to protect conveyor belt system. ***(11 marks)***

b) Match the given words about conveyors to the given phrases. *Carcass, Skims, Covers.*

(9 marks)

i. Extend service life with desirable properties. _____

ii. Absorb impact of falling material from the chute. _____

iii. Failure of it can cause idler junction fault and ply separation. _____

Examiner: **J. K. Annan**