

B. E. Part-III, 5th Semester Final Examination, 2012
Underground Mining Machinery (MN504)

Time: 3 hours

Full Marks: 70

Use separate answer script for each half
Answer SIX questions, 1&6 compulsory and any ^{four} ~~two~~ ^{totaling at least} from each half.
Marks are given at right side of questions.

First half

1. a) Calculate the motor power of a winder. The RMS torque of the winder is 264kNm, the winding drum diameter is 6m (cylindrical in shape) and the maximum speed of the rope is 8m/s.
a) A train of wheels transmits 4kW. The driving pinion has 20 teeth of 8mm module. Calculate the permissible speed in r.p.m. for the pinion if the pressure between the teeth exerted at the pitch points is 500kN.
b) Describe the merits of suspended caliper brake in comparison with the anchor post brake.

(4+6+3)
2. A winding engine with cylindrical drum & without tail rope hoists per wind 3T of pay-load of copper in a mine car up a vertical shaft, 600m deep. As the loaded cage comes up, the empty cage with a mine car goes down. A mine car of tare 1.5T. Weight of the cage, the cage chains and suspension gear is 5T. The winding cycle consists of acceleration 10s, constant speed 30s, and deceleration 10s. The decking period is only 10s. The winding rope weighs 5.59kgf/m length. Length of the rope from the top cage to drum when decking is 50m. The headgear pulleys are 4.2m diameter and each weighs 2T. Calculate the torques at different stages of winding. Assume your conditions.

(11)
3. a) Draw a simple layout of traverser circuit arrangement at pit top of a mine and describe.
b) Describe the advantages of Multi-rope Koepe winding system.

(6+5)
4. a) Describe with diagram the working principle of rotary vane compressor.
b) What are the statutory provisions for using of winder ropes?

(5+6)
5. a) What is regenerative braking?
b) Describe the statutory provisions regarding the use of armoured cable.
c) Compare the merit and demerit of electrical winder over steam winder.

(3+4+4)

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Second Half

~~Q1 is mandatory and answer any two from the rest. All parts of a question should be answered sequentially.~~

6. ~~1.~~ Answer the short questions highlighting the statutes where ever possible - ~~1x1.5~~
10x1.5
- i. What is role of Atmospheric pressure in pumping of water?
 - ii. What is the distance maintained between stop block and run away switch?
 - iii. What is the distance stipulated in CMR 1957 for a haulage and conveyor roadways in belowground when efficient telephonic communication system shall be provided?
 - iv. How Bernoulli's theorem does help pumping operation?
 - v. State the provision given in CMR 1957 when inclination of conveyors is very high and length is more than 30m?
 - vi. How tail rope haulage is suitable for waste disposal?
 - vii. What is the configuration of Carcass medium of belt conveyor?
 - viii. How loop-take up part of conveyor helps the conveying system?
 - ix. What are the problems of using overhead wire loco in coal mines?
 - x. What sort of rope construction is suitable for cranes and why?
7. ~~2.~~ State the characteristics of following types of wire ropes – 4+2+4
- i) Ordinary lay round stranded rope
 - ii) IWRC type rope
 - iii) Full locked non-stranded wire rope
8. ~~3.~~ i) What are the parameters to be considered by the CM prior to fixing the number of coal tubs per set of train in case of DRH? 3+7
- ii) An endless haulage operates on a roadway of 1.2km long dipping at 1 in 18 and draws 300 tons of coal per shift (effective time in a shift = 6hrs). The load weighs 1450 kgf each while empties 550 kgf. The rope dia 32mm. Tub and rope frictions are 1/40 and 1/20 respectively. Speed of the rope is 3.2kmph. Estimate the power required to pull the loads up the gradient.
9. ~~4.~~ i) State the location, purpose and number of types of device affixed on the haulage Track for DRH – 5+5
- Buffer, Backstay, Jazz rail, Drop war wick and Stop block
- ii) A direct rope haulage pulls 8 loaded tubs at a time up an incline dipping at 1 in 8. An empty tub weighs 500 kgf and has a capacity of 950 kgf of mineral. Length of the roadway covered by the haulage is 1 km. The rope dia is 28 mm and rope speed is 10 kmph. Co-efficient of friction for the tubs and for the rope is 1/20. Estimate the power required by the engine.
10. ~~5.~~ Write short notes on – 4+6
- i) Sequence control operation of conveyors
 - ii) Scraper chain conveyor