

BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR
B.E. 5TH SEMESTER (MINING) FINAL EXAMINATIONS, 2011
Underground Mining Machinery (MN504)

Full Marks: 70

Time: 3 hrs

Question Nos. 1 & 6 are compulsory. Answer FOUR questions from the rest, taking TWO from each half. All parts of a question should be answered at one place Marks are indicated on the right margin of the questions

First half

1. a) An electric motor has an output of 300W at 3000 r.p.m. A single-start worm is direct-coupled to it and the worm engages a worm wheel that has to run at 30 r.p.m. How many teeth are required in the worm wheel and what torque will be transmitted by each shaft if transmission efficiency is 60%? If the circular pitch of the teeth in the worm wheel is 6mm what will be the pressure on the teeth tangential to the pitch circle?
b) How inter-cooler reduces required motor power in poly-tropic compression? (7+6)

2. Calculate the torques at different stages for a tower mounted friction winder with the following data:-

- Loaded skip weight-8tef
- Empty skip weight-4.5tef
- Rope weight-5.78Kg/m length
- Drum diameter-2m
- Acceleration time-16s
- Constant speed time-30s
- Retardation time-15s
- Maximum rope speed-8.15m/s
- Shaft depth-350m
- Tower height-30m
- Bottom rope loop-10m

Moment of inertia of the friction pulley and the motor geared to it, referred to the axis of friction pulley, is 24 tonne-m². Assume static torque due to friction 0.08 times the torque due to loaded skip plus empty skip. (11)

3. a) Show that in simple train of wheels, the velocity ratio transmitted is independent of intermediate shaft of shafts.
b) Calculate the motor power of a winder. The RMS torque of the winder is 186 KNm, the winding drum diameter is 5.4m (cylindrical in shape) and the maximum speed of the rope is 8.5 m/s. (6+5)

4. a) Name the safety devices which are to be attached with a winder.
c) An air receiver having 6m³ contains air at a temperature of 25°C and under a pressure of 1800KN/m². After working of a grab to which the receiver is connected the pressure of air receiver falls to 1400KN/m² and the temperature to 20°C. Determine the volume of air at STP that has been used from the receiver by the grab. (5+6)

5. b) Draw and describe the working procedure of Lofco system of layout.
c) What are the statutory provisions for using of winder ropes? (6+5)

Second Half

- Q6. i) Answer the questions as directed- 5x3
- Benefit of keeping loop-take-up in belt conveyor
 - Requirement of exhaust conditioner in diesel loco
 - Preformed and ordinary lay rope with cranes
 - Sequence control system with series of belt conveyors
 - Suitable parameters to install DRH in mines
7. An E/H is to be installed and following data are given to find out rope size and power to drive the pulley- 10
- Length of the haulage plane : 900m
 - Output to be handled : 150t / shift
 - Working shift hours : 5
 - Rope friction : 1/40
 - FOS : 5
 - Rope strength : $2500 d^2$ te(where d is the rope dia in cm)
 - Haulage speed : 4kmph
 - Weight of empty car : 500 kgf
 - Weight of loaded car : 1500 kgf
 - Tub friction : 1/50
 - Gradient : 1 in 20 against the load
- Q7. i) What are the conditions suitable for application of loco in underground mines? 4+6
ii) Write in detail the battery loco while in operation in underground mine
- Q8. i) Write a note on method of feeding related to belt conveyor 2+3+5
ii) Write about the construction of Scraper Chain conveyor. Highlight on its problems.
- Q9. i) Distinguish between Stranded and Non-Stranded rope. 5+ 5
ii) 180 ton of coal is to be hauled by direct rope haulage in a shift of 6 hours hauling time where the length of haul is 1400m. The average speed of rope is 6 Kmph. Set changing time is 1 min & tub capacity is 1.5 ton. Calculate the number of tubs per set?
- Q10. i) How to start a centrifugal pump? State few problems as normally seen during its operation. 2+2+6
ii) A direct rope haulage pulls 10 loaded tubs at a time up an incline dipping at 1 in 10. An empty tub weighs 500 kgf and has a capacity of 900 kgf of mineral. Length of the roadway covered by the haulage is 1200m. The rope diameter is 30 mm. Rope speed is 10 kmph. Co-efficient of friction for tubs and for the rope is 1/25. Estimate the power required by the Engine.