B.E. 5th Semester (Mining) Final Examination, 2013
Bengal Engineering and Science University, Shibpur
Underground Mining Machinery (MN504)

F.M: 70 Time: 3 hrs.

Use separate answer script for each half
Answer SIX questions (1 and 6 compulsory and any two from each half)
All parts of a question are to be answered at one place.

First Half

1. **a)** An electric motor has an output of 250W 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 70 percentage? If the circular pitch of the teeth in the worm wheel is 6 mm what will be the pressure on the teeth tangential to the pitch circle?

   b) Calculate the motor power of a winder. The RMS torque of the winder is 165 KNm, the winding drum diameter is 6 m (cylindrical in shape) and the maximum speed of the rope is 10 m/s.

   [8+5]

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 = 5.78Kgf/m length
   Drum diameter = 2m
   Acceleration time = 16 s
   Constant speed time = 30 s
   Retardation time = 15 s
   Maximum rope speed = 8.15 m/s
   Shaft depth = 350 m
   Tower height = 30 m
   Bottom rope loop = 10 m

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

3. **a)** Find the workdone in a compressor in compressing air adiabatically with the following data:-

   Initial absolute pressure = 1 bar
   Final abssolute pressure = 5 bar
   Initial volume = 8 cubic metre
   Index of adiabatic compression, n = 1.4

   b) Describe the advantages of Multi-rope Koepe winding system. [7+4]

4. **a)** "Freezing at exhaust ports create problem in air engine" how do you overcome the same?

b) Why fleet angle in drum winding system is restricted to 1.5?
c) What are the statutory provisions for using of winder ropes? [4+2+5]

5. a) What is the necessity of recapping of rope of a winder?
b)Why safety detaching hooks are used in drum winding system? Describe the working principle of King detaching hook. [4+3+4]

Final Examination of 5th Sem Mining Engineering students, Dec 2013

Sub: Mining Machinery I (MN 504)

Second Half

It is obligatory to write all parts of a question at one place
Q No. 6 is mandatory and Answer any 2 from the rest

6. a)Why IWRC rope has more load bearing capacity than flat rope? **10x1.5**
   b)What is the purpose of exhaust conditioner?
   c)What are the objectives of using loop-take-up in belt conveyor?
   d)What is the function of impeller in pump?
   e)Why flat ropes are very weak?
   f)What is the correction location of battery charging station?
   g)What sort of rope construction is suitable for cranes and why?
   h)What is the role of Atmospheric pressure in pumping of water?
   i)What is the distance maintained between stop block and run away switch?
   j)What is the distance stipulated in CMR 1957 for a haulage and conveyor roadways?

7. a)Sketch and describe district layout to show the working combination of Scraper chain conveyor and belt conveyor. 7+3
   b) What is the function of sequence control operation?

8. a) How will start and stop a centrifugal pump? What are major troubles are Expected with underground pumping operation? 4+2+4
   b) 360 tons of coal is to be hauled by DRH in a shift (consider 7 effective working hours in the shift) where hauling length is 1500 m, gradient is 1 in 8. The average speed of rope is 7.5kmph and set changing time is 2 minutes. If capacity of each tub is 1.5 tons Calculate number of tubs per set of train?

9. a) Sketch and describe Endless haulage. 4+6
   b)An endless haulage operates on a roadway 850m long dipping at 1 in 16 and draws 420 tonnes of coal in a shift (effective time is 7 hours). The load weighs 1500 kgf each and empties 600 kgf. Rope dia 30mm, tub friction and rope friction 1/50 and 1/20 respectively.Speed of the rope is 3kmph. Estimate the power requirement by the engine. Consider the loads are pulled up the gradient.

10. a) What is the configuration of Carcass medium of belt conveyor? How can you reduce the pollutants in diesel loco? 3+4+3
    b) Write down about the safety devices of DRH with possible reference of statutes.