Examination 2005

EMC COURSE ON MINE AUTOMATION AND MAINTENANCE, 2005,
HELSINKI, FINLAND

TOTAL MARKS : 100
PASS MARK 40

QUESTION ON AUTOMATION AND ROBOTICS (40 marks)

1. Discuss the trends in "mining automation" (You can use Caterpillar's vision of mine automation to make your points clear) automation
2. Discuss the role of of ICT in implementation of autonomous mining system
3. Discuss the potential and problems associated with automation and robotization of mining operation.
4. Discuss the different types of underground navigation systems available in market for possible use by the mining companies. What is an Infra free navigation system?
5. Why is it important to consider software and human reliability for an automatic operating system?

QUESTIONS- ON MINE MAINTENANCE (60 marks)

1. We know that it is difficult to track down the indirect cost (e.g. extra capacity, cost of quality, production losses, high insurance premium, cost of idle labour etc.). List the factors that affect the indirect costs. Give examples to support your arguments.
2. Define 'failure' and the failure development process.
3. List the different basic tools of maintenance analysis that can be used for studying maintenance problem.
4. Discuss the application of Pareto's plot in Maintenance.
5. Define reliability & maintainability and maintenance supportability?.
6. Calculate the mean time to failure of a series system consisting of 2 units with failure times, which are exponentially distributed and have different mean value.
7. A certain unit has R (10) = 0.8 How many units of this type are needed in a parallel system to get $R_p(10) > 0.90$?
8. Make a TTT-plot using the following times between failure data from an LHD machines at the LKAB Kiruna mine:TBF: 20, 35, 50, 69, 98. (in hours). What are your conclusions from the plot ? Estimate the optimal maintenance interval given that the cost of repair is 3 times if the bearing fails during operation compared to the preventive maintenance costs.
9. What are the key features in application of RCM and TPM?
10. What is condition based maintenance. What are the different methods used for condition monitoring of a equipment?