EMC COURSE ON MINE AUTOMATION AND MAINTENANCE, 2004, HELSINKI, FINLAND

TOTAL MARKS : 100
PASS MARK   : 40
Time   3 hours

QUESTION ON AUTOMATION AND ROBOTICS

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1. Define the term AUTOMATION and ROBOTICS? What is the major challenge associated with full automation of mining systems (fully autonomous system).
2. Discuss the role of Information and Communication Technology (ICT) in automation and robotization of mining systems.
3. Discuss the different types of underground navigation systems available in market for possible use by the mining companies.

QUESTIONS- ON MINE MAINTENANCE

1. Define the term "maintenance". You have been appointed as a maintenance manager of a newly built ore processing process plant. Discuss the factors that you would like to examine and analyze before deciding the maintenance strategy for your plant.
2. How LCC analysis can be useful in selection of engineering systems.?"
3. Define 'failure' and the failure development process.
4. What is meant by direct and indirect costs of maintenance?
5. Define reliability and maintainability and discuss the desirable maintainability characteristics.
6. Calculate the mean time to failure of a series system consisting of 4 units with failure times that are exponentially distributed and have different mean value.
7. Make a TTT-plot using the following times between failure data from an LHD machines at the LKAB Kiruna mine:TBF: 18, 35, 50, 99, 65. (in hours). What are your conclusions from the plot ? Estimate the optimal maintenance interval given that the cost of repair is double if the bearing fails during operation compared to the preventive maintenance costs.
8. Describe the four different types of benchmarking being used by industries.
9. What are the key features in application of TPM philosophy? Explain the term OEE.
10. What are the main features of RCM analysis? Can a mining company implement TPM and RCM simultaneously?
11. Why should we need maintenance performance indicators? List 3 maintenance indicators being used in mining industry.
12. List 5 condition monitoring methods used in industries? Discuss one of them.