AAVARTAN'22-23

VIGYAAN

DEPARTMENT OF MINING ENGINEERING

PROBLEM STATEMENTS

MIN01.

Prepare a model to monitor and operate independent Truck Dispatch system in the mines using GPS/DGPS (Differential Global Positioning System) and GIS.

GPS: global positioning system; a system by which signals are sent from satellites to a special device, used to show the position of somebody/something on the surface of the earth

GIS: A geographic information system (GIS) is a system that creates, manages, analyzes, and maps all types of data. GIS connects data to a map.

MIN02.

Deep sea mining is a growing subfield of experimental seabed mining that involves the retrieval of minerals and deposits from the ocean floor found at depths of 200 metres (660 ft) or greater.

·   Describe the ground and water shock propagation in deep sea mining (Drilling and Blasting).

·   What are the different ways to monitor the underwater exploration of minerals? Explain.

·   How can one ensure the Safety to Nearby Marine Structures due to Blast Induces Impact?

MIN03.

Artificial Intelligence mining industry is one of the oldest industries of the world. The Mining Industry plays an important role in the economic development of a country. Currently, there is a big difference between demand and supply which tells us that the current methods are not much effective. Artificial Intelligence, in this context, has presented us the idea of Smart Mines and has resulted in increased human safety as well as increased efficiency. As this technology is still under development, there is much more that can be added to the idea of Smart Mine. Prepare a model depicting a Smart Mine with AI Integration which you can vision in 2050 in Indian Mining Industry.

MIN04.

Underground coal gasification (UCG) is a promising future alternative for un-worked coal. Through a matrix of wells, UCG allows coal to be gasified in situ within the coal seam. The expanding global need for energy, the depletion of oil and gas resources, and the prospect of global climate change have sparked interest in UCG. UCG has a huge opportunity to extract low-grade, inaccessible coal deposits and convert them into syngas commercially and competitively, with applications in power, fuel, and chemical production.

Prepare a plan on how to gasify the underground coal and deliver the end product to the surface unit for further use.

MIN05. **<u>Extraction of Coal at Greater Depth</u>**

Propose a suitable and effective methodology for extraction of coal at a depth of 500m for Indian geo-mining (DEEPCOAL). The major objective of the project is to prepare guidelines, monograms and design methodology for extraction of coal at a depth of 500m for Indian geo-mining conditions. The allied objectives are:

● Scientific investigations for design and planning of mining methods for deep mines; .

● Development of methodology for assessment and design of ventilation parameters for deep shaft coal mines;

● Development of high concentration and high rate filling technology for extraction of deep seated coal seam;

● Simulation and visualization of deep mining and geosciences problems;

● Simulation of the caving of strata overlying coal seam, support-strata interaction during extraction and development of guidelines for design of suitable mining method for deep mines; and

● Geostatistical classification of roof rocks and selection of mining methods for deep mines.

MIN06.<u>**Extraction of Contiguous Seams**</u>

When the parting distance between two seams is less than 9m, then they are called Contiguous Seams. Due to this small parting distance these cannot be extracted as simple seams. After getting permission from the concerned authorities, the methods of extraction are:

(i) First extracting the upper seam followed by the extraction of lower seam. But this method has many drawbacks. During the extraction process, the gob of the upper seam may get filled with water and if the parting distance is too less and the seams are highly inclined, undermining may occur. Also crushing may occur if the parting distance is too less. Prepare a model explaining this method of extraction of contiguous seams and also suggesting possible changes to be made to overcome the above mentioned problems.

(ii) First extracting the lower seam followed by extraction of upper seam. But there are some major problems faced during the process. Uneven gradients, floor lifts and fractured roof may be faced while working in the upper seam as a result of prior excavation of the lower seam. Prepare a model explaining this method of extraction of contiguous seams and also suggesting possible changes to be made to overcome the above mentioned problems.

(iii) Simultaneous extraction of both the seams. Although this method has proven to be advantageous over the other methods (extraction from 1 seam at a time) and a lot more productive, it has violent surface effects. Prepare a model suggesting some innovative changes to be made in the process of extraction to reduce the surface effects without affecting the production.

MIN07. **<u>Fleet and fuel management in Mining**</u> –

Fleet and fuel managers face many operational challenges. They are unable to track the exact location of their fleet during operation. Also it become tedious to maintain its record in excel or register, leading to unnecessary cost and inefficiency. The basic idea behind this problem statement is to develop a prototype showing real-time monitoring of fleet and fuel consumption that would monitor the information of vehicles and load. This would not only lead to prevention of fuel theft but also management of asset for optimization of mining operations. This management system will boon commercial and industrial sectors. It is expected from participants to focus on document management, driver management, expense management, improve vehicle utilization, trip creation, track without GPS and fuel theft control.

MIN08. **<u>Surveillance System to detect and monitor various mining activities**</u>

Here participants are expected of building a prototype of a Surveillance System that would detect accidents, unusual incidents, Hazards, geohazards, etc. An alerting system should also be embedded in it that would alert the user when Coal Mine Safety is breached. This will ensure coal mine safety.

MIN09. <u>Operation of heavy earth-moving machineries during rainy season</u>

During mining several earth-moving machineries are brought in to use like scrapers, bull-dozers, tractors, etc. During rainy season, it becomes very difficult to operate such machines due to extremely poor visibility condition leading to significant loss of excavation and production. Rainy season causes a lot of obstacles in the production of the mines due to water lodging in the deepest area of mines of washing off of benches and loose rock materials to the lower benches. Develop a solution to overcome the above stated problem and smooth functioning of HEMM in the rainy season.

MIN10. <u>Drones for Mines</u>

Here participants are expected to design a drone to monitor operations for real-time data for data driven information on mining sites like drilling, blasting, etc. The concept involved is Drone Data Analytics.

MIN11.

Mining causes a lot of disturbance to the local environment. Care must be taken to deal with the adverse effects of mining to the adjoining structures and the people living in its vicinity.

Develop a prototype to solve the problem of air, noise, and water pollution caused by mining activities in the area as well as the method to deal with the blast induced vibrations due to blasting. Your solution must also include the procedure for rehabilitation and resettlement of the people affected by the mine and ways to deal with the physical, chemical and biological wastes due to mining.

MIN12. <u>Abandoned Mines</u>

Mine Closure leads to lose to the economy of the affected area. Mine abandonment must be treated as important as mine acquisition and care must be taken to demolish all the structures in the mines and return the mined land so that it could be of economic use to the society.

Develop a prototype for the above problem to deal with the problem of mine Closure and abandonment