

FOUNDATIONS OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

MID SEMESTER EXAMINATION, 2024-2025

Date: 23 February, 2025
Marks

Total Marks – 30

Time Duration – 2 hours

Instructions:

Attempt all questions.

Read the questions carefully before answering.

Case 1

Maria Fernandez is a bright, popular, and well-informed mechanical engineer who graduated with an engineering degree from State University in June 2014. Anticipating that she could make into a nationally ranked college, she took a break for one year after high school. Though she was able to be in the national rank list, she got branch of her choice only in the state university and choose that. During the last semester of engineering, she went out on many job interviews, most of which she thought were conducted courteously and were reasonably useful in giving both her and the prospective employer a good impression of where each of them stood on matters of importance to both of them. It was, therefore, with great anticipation that she looked forward to an interview with the one firm in which she most wanted to work: Apex Environmental. She had always had a strong interest in the environment and believed that the best use of her training and skills lay in working for a firm like Apex, where she thought she could have a successful career while making the world a better place. The interview, however, was a disaster. Maria walked into a room where five men—the president of the company, two vice presidents, the marketing director, and another engineer—began throwing questions at her that she felt were aimed primarily at tripping her up rather than finding out what she could offer through her engineering skills. The questions ranged from being unnecessarily discourteous (“Why would you take a break after your +2 and take admission in a state university, if you’re such an intelligent person?”) to being irrelevant and sexist (“Do you currently single? Are you planning on getting married anytime soon?”). Then, after the interview, she met with two of the gentlemen individually (including the president), and the discussions focused on her technical expertise. She thought that these later discussions went fairly well. Thereafter, a few candidates were made to wait in the lobby, and

after two hours of wait, they were asked to leave. The receptionist informed them that the company will get back to them soon. However, given the apparent aimlessness and even mean-spiritedness of the panel interview, she was astonished when several days later the firm made her a job offer. The offer forced her to consider several matters. From her point of view, the job itself was perfect. She liked what she would be doing, the industry, and the firm's location. And in fact, the president had been quite courteous in subsequent discussions. She was left wondering whether the panel interview had been intentionally tense to see how she'd stand up under pressure, and, if so, why they would do such a thing.

Question 1.**5 Marks**

Would you take the job offer if you were Maria? If you're not sure, what additional information would help you make your decision - List the 5 main points that you think should help Maria to make an informed decision.

Question 2.**5 Marks**

The job of applications engineer for which Maria was applying requires (a) excellent technical skills with respect to mechanical engineering, (b) a commitment to working in the area of pollution control, (c) the ability to deal well and confidently with customers who have engineering problems, (d) a willingness to travel worldwide, and (e) a very intelligent and well-balanced personality. List 10 questions you would ask when interviewing applicants for the job.

Case 2

Chandler Bing and Sons is a leading player in the automotive industry, known for producing high quality vehicles and components. However, in recent months, the company has been facing a series of challenges related to labor strikes. The employees, represented by a powerful union, have been demanding better working conditions, higher wages, and improved benefits. The management is struggling to find a resolution that satisfies both the workforce and the company's financial goals.

Questions 3.**5 Marks**

Evaluate the role of HR manager in handling company's operations, production schedules, and overall business performance. Discuss in detail the role of the HR in conflict resolution.

Case 3

After spending several weeks on the job, Penny Hofsteder was surprised to discover that her Business Partner Howard Wolowitz has not formally evaluated any employee's performance

for all the years that he has owned the business. Howard's position was that ~~he~~^{she} had "a hundred higher-priority things to attend to," such as boosting sales and lowering costs, and, in any case, many employees didn't stick around long enough to be appraisable anyway. Furthermore, he contended that manual workers such as those doing the pressing and the cleaning periodically get positive feedback in terms of praise from him for a job well done, or criticism. Also, Howard is never shy about telling his managers about store problems so that they, too, get some feedback on where they stand.

This informal feedback notwithstanding, Penny believes that a more formal appraisal approach is required. She believes that there are criteria such as quality, quantity, attendance, and punctuality that should be evaluated periodically even if a worker is paid on piece rate. Furthermore, she feels quite strongly that the managers need to have a list of quality standards for matters such as store cleanliness, efficiency, safety, and adherence to budget on which they know they are to be formally evaluated.

Questions 4.

10 Marks

Discuss the informal feedback mechanisms mentioned in the case, such as praise from Howard for manual workers. Do you think these informal methods are sufficient for employee performance management? (Give examples of potential appraisal problems and how to deal with them).

Question 5.

5 Marks

Develop a performance appraisal method for the workers and managers of the store.

Department of Mining Engineering
Indian Institute of Technology (Indian School of Mines), Dhanbad

Mid Semester Examination

Session: 2024 – 2025 (Winter)

Programme: VI B.Tech

Full Marks: 64

Subject: Mine Legislation and Safety (MNC 304)

Time: 2 hours

Answer all the questions

1. State the provisions of the followings as per 'The Mines Act, 1952'
(a) Powers of Inspectors
(b) Hours & limitation of employment (6+6)
2. State the provisions laid down in the CMR 2017 regarding the followings:
(a) Notice of dangerous occurrence or accident,
(b) General qualifications and practical experience of candidates for Manager's Certificate examination (6+6)
3. An opencast coal mine is having average annual output of 3.2 million tonnes of coal. The average overburden materials are need to be handled per year is 15.4 million m³. The aggregate power of all the machinery used in the mine is 8570 KW. The electrical energy of 1100 volts is used and the installed capacity of all electrical equipment is 15.5 MVA. State and justify according to CMR 2017, the number and qualifications required of Manager, Assistant manager, Safety officer, Surveyor and Engineer of the mine. [The density of coal is 1342 Kg/m³ (approx.)] [15]
4. State the provisions laid down in the Mines Rules 1955 regarding the followings:
(a) Unfit persons not to be employed
(b) Duties of Workmen's Inspector (5+5)
5. State the provisions as laid down in the Mines Vocational Training Rules 1955 and the Mines Rescue Rules, as the case may be, regarding the followings:
(a) Training of persons handling explosives
(b) Rescue room acting as rescue station (5+5)
6. What accidents come under the purview of the Mines Act? Define 'Mine Disaster'. State the relationship between the severity rate, frequency rate and combined index of mine injury. (2+1+2=5)



Department of Mining Engineering
Indian Institute of Technology (Indian School of Mines) Dhanbad



Midsem Examination Winter Semester 2024-2025

Subject: Deep Coal Mining (Code: MND 412) (ME, MECH, EE, ECE, CSE, MME, CIV, AGL, MLMTE, EP, PE, CE)
Course for 3rd & 4th Year (6th & 8th Sem) B.Tech. (108 nos.)

Time: 120 minutes (03:00PM–05:00PM) | Venue: NLHC LH 06-08 | Date: 17-02-2025 | Maximum Marks: 60

Instruction: Please mention your **Serial No.** on the top of answer sheet as per Attendance List

Answer all the questions of the two sections and marks are assigned against each section

Section A: Numerical Answer Type Questions – 35 marks

Answer all the questions and marks are assigned against each question

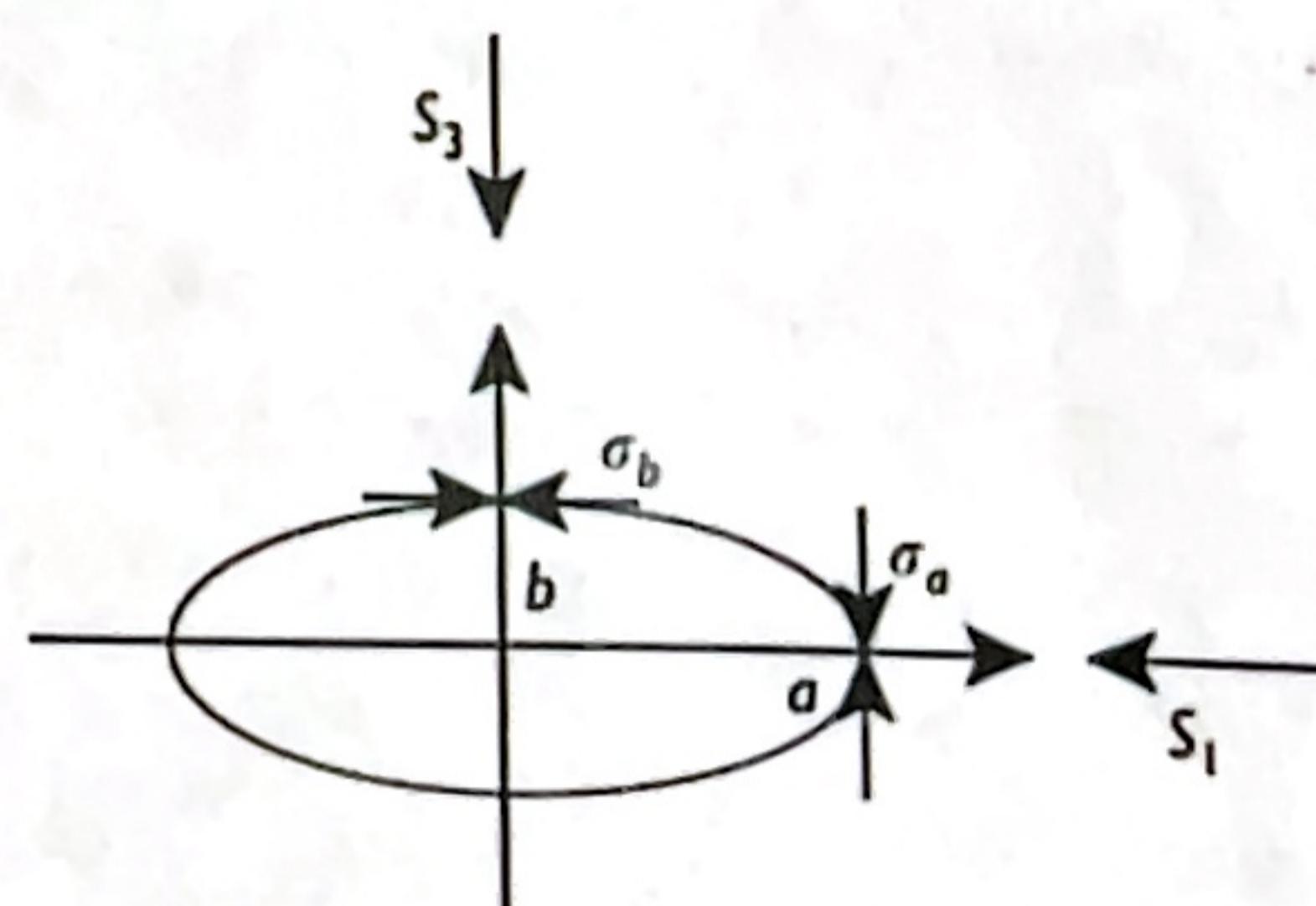
1. Bord and Pillar mining method is used in a coal seam where the overburden density averages (γ) 1 psi/ft. Laboratory tests on core samples show that the coal has an unconfined compressive strength (C_o) 3,000 psi, tensile strength (T_o) 150 psi, Young's modulus (E) $0.35 * 10^6$ psi and Poisson's ratio (ν) 0.30. Mining height is 15 ft, seam depth is 1,324 ft, entries are 21 ft wide, and strata dip is negligible. If pillar length is three times pillar width:

- (a) Determine the extraction ratio possible with a pillar safety factor of 1.8 with no size effects
(b) Determine the pillar dimensions, entry spacing (center to center) (c-c) at the FS (safety factor) and R (extraction ratio) determined previously for no size effects.
(c) Determine the extraction ratio possible with a pillar safety factor of 1.8 with size effect using $C_p = C_o \left(0.78 + 0.22 \frac{w_p}{H_p} \right)$.
(d) If the coal seam and other strata is dipping at 30° , estimate pillar stresses at a depth of 1,324 ft, assuming an extraction ratio of 20%.
(e) A joint set is present, strata are flat-lying and extraction is 20%; determine the range of joint dips that may lead to joint slip, assuming Mohr-Coulomb criteria for strata and joints with joint friction angle at 35° and negligible joint cohesion.

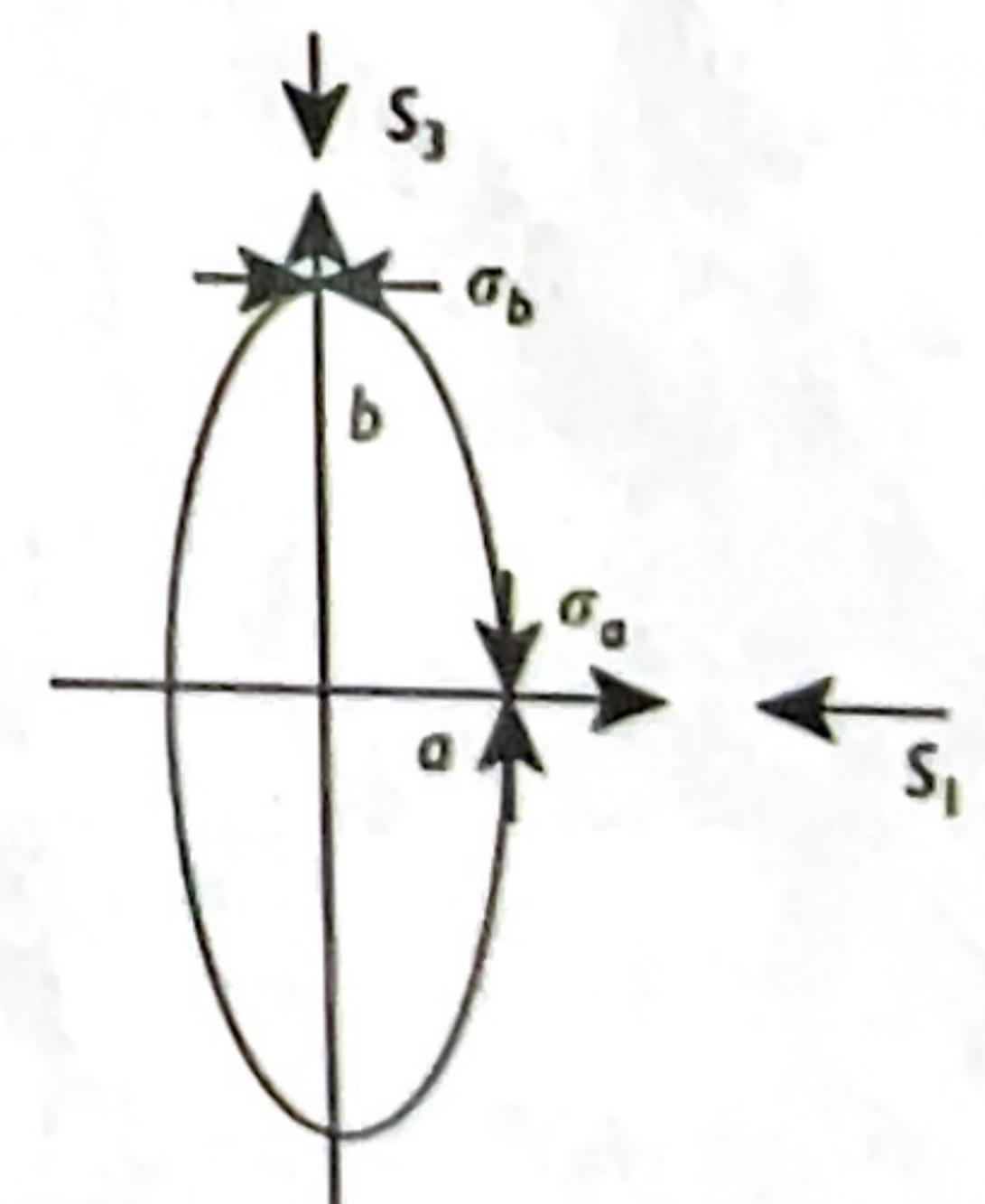
2. Consider an underground limestone mine in flat strata where pillars are 29 m high and depth is 258 m. Rock properties are: $E = 77.9$ GPa, $\nu = 0.20$, $C_o = 148$ MPa, $T_o = 11.6$ MPa, unit weight, $\gamma = 24.7$ kN/m³. A joint set of variable dip pervades the mine. Mohr-Coulomb properties are: $c = 4.34$ MPa, $\phi = 40^\circ$. Pillars must have a safety factor of 2.5 with respect to any potential failure mechanism. Is this possible? Show why or why not by constructing a Mohr's circle for joints. (1 + 2 + 1 + 3 + 2 = 9 marks)

3. An elliptical cross section may be advantageous in a stress field where the major and minor pre-excavation stresses S_1 and S_3 are aligned with the geometric axes of the section.

- (a) Show that the preferred orientation is with the long-axis of the ellipse parallel to S_1 .
(b) Arrange the stress concentration factors for points a and b in both the cases where long-axis of ellipse is parallel and perpendicular to S_1 .
(c) Discuss the condition for selecting the best elliptical shape for a given *insitu* stress field (may be explained considering hydrostatic conditions). (3 marks)



(a) Long axis parallel to S_1



(b) Short axis parallel to S_1

4. A vertical shaft of elliptical section is being considered in a region of high horizontal stress. Measurements along the shaft route indicate the preshaft principal stresses in psi (compression positive) are given by $S_v = 1.1H$, $S_h = 100 + 1.5H$, $S_H = 500 + 2.2H$ (H is depth in feet). Determine the optimum orientation and aspect ratio of the section. (2 + 2 + 2 = 6 marks)

(4 marks)

5. A 6 m diameter circular shaft is planned in massive rock. Laboratory tests on core from exploration drilling show that $C_o = 152 \text{ MPa}$; $T_o = 8.3 \text{ MPa}$; $\gamma = 23 \text{ kN/m}^3$; $E = 34.5 \text{ GPa}$; $G = 34.5 \text{ GPa}$. Depth is 915 m and site measurements show that no tectonic stresses are present.
- (a) Determine the factors of safety with respect to failure in compression and tension.
 - (b) If the opening is in an *insitu* stress field such that $\sigma_h = \sigma_v$, what are the safety factors?
 - (c) If the opening is in an *insitu* stress field such that $\sigma_h = 0.01\sigma_v$, is there a possibility of failure? Justify.
 - (d) Determine stress concentration factors (K_a & K_b) on the walls of an optimally oriented ellipse (3 ft x 6 ft) in the given conditions.

(4 + 1 + 1 + 2 = 8 marks)

6. (a) Design support system by showing and mentioning grid pattern of 1.8 m length roof bolts for galleries and junctions developed using Continuous Miner Technology with the help of following information provided: RMR = 50; Gallery width = 5.5 m; Rock density, $\gamma = 2500 \text{ kg/m}^3$; Grouting strength of resin = 15 tons; Factor of Safety = 2 for both galleries and junctions.
- (b) Design manner of pillar extraction based on cut-out distance of Continuous Miner mentioning size of rib/snook, slicing angle and location of breaker-line support. [Assume depth of cover (H) = 300 m, RMR (R) = 50, height of working (h) = 6 m, Young's modulus of roof (E) = 4 GPa, Gallery width (W) = 5.5 m]. Following relationships may be used for the design purpose.

For support system in developed galleries and junctions

$$\text{Rock load in roadways} = B\gamma(1.7 - 0.037RMR + 0.0002RMR^2)$$

$$\text{Rock load in junctions} = 1.25 * \text{Rock load in roadways}$$

$$\text{For pillar spalling;} x_0 = 0.00492hH$$

$$\text{For estimating cut-out distance;} S = 14.61 + 1.98E - 2.12W$$

For design of rib/snook

$$A = 0.16H^{0.89}R^{0.14}h^{0.31}$$

$$\frac{w_e}{h} = 0.18H^{0.15}R^{0.10}h^{-1.03}A^{0.60}$$

$$w_e = 0.18H^{0.15}R^{0.10}h^{-1.03}A^{0.60}$$

Section B: Short Descriptive Answer Type Question (Answer in 2-3 lines/pointwise) – 25 marks

Answer all the questions and marks are assigned against each question

7. (a) Draw a curve showing the relationship between major principal stress and distance over pillars in the Bord and Pillar mining method using the concepts of: (i) Tributary Area Technique (ii) Elastic Analysis and (iii) Elasto-Plastic analysis.
- (b) Discuss the limitations of tributary area theory.
- (c) Mention the conditions with respect to dimension of pillar for squat and slender pillars.
- (d) Express the generalized forms of different pillar strength equations developed so far for Bord and Pillar mining method with meaning of each symbol used.
- (e) Discuss the different principal modes of pillar failure in Bord and Pillar mining method.
8. (a) Formulate the relationship to estimate the width required for designing barrier pillars, considering: (i) the total overburden pressure. (ii) the effect of the influence angle (δ) of the overlying strata.
- (b) Differentiate (i) main fall & local fall (ii) first goafing & subsequent goafing (iii) cavability index & bulking factor.
- (c) Discuss the different instrument used for monitoring the Continuous Miner working and their location in the panel during depillaring in Bord and Pillar Mining Method.
- (d) Churcha and Jhanjra are the only two underground coal mines of India which are making profits. Discuss.
- (e) Discuss the statistics related to coal production from underground and opencast mining methods and also the coal import of last 10 years of India.
- (f) Where do peak stresses occur in an underground opening, and what factors influence their occurrence?

(3 + 1 + 1 + 1 + 1 = 7 marks)

(2 + 3 + 2 + 2 + 2 + 2 = 13 marks)

9. (a) Brief about the crisis of coal and power in India.
- (b) Critically analyse the role of coal and renewables in India's Electricity mix by 2030.
- (c) Explain the conceptual model for encroachment of different nature of roof in absence of an efficient breaker line support and incompetent rib/snook at the goaf edge.
- (d) Explain the different adopted manner of pillar extraction using Continuous Miner Technology.
- (e) Discuss the reasons of burial or trapping of Continuous Miner machine in Bord & Pillar Mining Method.

(1 + 1 + 1 + 1 + 1 = 5 marks)

***** END OF QUESTION PAPER *****

Indian Institute of Technology (Indian School of Mines), Dhanbad

Mid Semester – Winter Examination [2024-2025]

Program: B. Tech

Branch: Mining Engineering

Semester: 6 (Winter Semester)

Total Marks: 30

Course Name: Mine Automation and Data Analytics

Course Code: MNC305

Answer all questions

Illustration with appropriate figures is mandatory for all questions

Question 1

5 Marks

How does the Mining Automation Maturity Model (MAMM) categorize different levels of automation in mining operations, and what are the key technological advancements required to transition between these levels? Illustrate your explanation with a figure representing the MAMM framework.

Question 2

5 Marks

What are the fundamental differences between a Closed-Loop Control System and an Open-Loop Control System in the context of mining automation? Explain with a supporting figure illustrating both control system architectures

Question 3

5 Marks

What are the five key risk management concepts used for securing Autonomous Haulage Systems (AHS) in mining operations? Support your explanation with a figure illustrating these risk management concepts.

Question 4

5 Marks

What are the basics of robotics, and how are industrial robots structured in terms of their main components? Additionally, what are the different types of remote operation, particularly in mining automation? Support your explanation with a figure illustrating the main components of industrial robots.

MID-SEMESTER EXAMINATION

Examination: 6th Sem B.Tech (CHM, CIV, ESE, FMME, M&C, MNE, MME, EE, ECE, CSE, M&C, PHY, MLMTE, & PE)

Session: 2024-2025

Semester: Winter

Subject: Coal Mine Methane Recovery and Utilization (MNO304)

Time: 2 hrs

Max. Mark: 30

Instructions: (i) Answer ALL questions, (ii) Use desorbed gas fraction chart, if required

<u>Q.No.</u>	<u>Question</u>	<u>Marks</u>
1.	Explain with diagrams the formation of coalbed methane and the different phases of methane movement in coal.	2+4
2	a) Explain with diagram the gas adsorption isotherm. b) If the desorbing samples of sub-bituminous Cretaceous-age coal from the San Juan Basin will have a coal diffusivity of $7.51 \times 10^{-4} \text{ min}^{-1}$. Calculate the time required to release 90% of the gas and 95% of the gas, respectively.	2 2+2
3	What are the major parameters influencing the selection of methane drainage methods in the coal seam? Describe with diagram the suitable conditions of any methane drainage technique.	2+4
4	What is hydraulic fracturing? Describe the applications of any two hydraulic fracturing fluids for stimulation treatment of coalbed gas wells.	2+4
5	a) Calculate the steady-state gas production from a vertical well for the following given conditions: <ul style="list-style-type: none"> • Permeability of coal = 3 md • Thickness of the coal seam = 40 ft • Average viscosity of gas = 0.02 cp • Average compressibility factor = 0.90 • Temperature = 60 °F • The radius of the well = 0.25 ft • External radius = 1000 ft • Pressure at external radius = 500 psi • Pressure at the well radius = 50 psi. • Coal density = 0.04 ton/ft³ If the gas content of coal is 600 ft ³ /ton, how many fracture wells will be needed to degas a longwall panel of $1000 \times 10,000$ ft in 5 years? Assume that the total gas production declines by the following power law with the characteristic 'n' of the coal seam equal to 0.8: $Q = At^n$, where Q is the cumulative gas production, A is the initial production, t is the time in day.	3+3

END

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