Roll No.

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR/MAY 2024

MINING ENGINEERING

Eighth Semester

MI 5012 – ADVANCED ROCK BLASTING TECHNOLOGY

(Regulation 2019)

Time:3hrs Max. Marks: 100

CO1 Understand the recent developments in blasting techniques adopted in surface and underground mines.

CO2 The students will learn about theories of rock breakage indicating the mechanics of rock fragmentation.

CO3 Learn the usage of modern instrumentation and software for monitoring and analyzing the blast performance.

CO4 Control the environmental effects due to blasting and design the blast accordingly as per the statutory provisions.

CO5 Understand the basic concepts of novel blasting techniques adopted surface and underground construction projects

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20 Marks)

(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	Distinguish between 'Ideal' and 'Non-ideal' explosives with an example..	2	CO1	L1
2	Define 'Characteristic Impedance'.	2	CO1	L2
3	Write a short note on 'Chapman-Jouguet' (C-J) plane.	2	CO2	L3
4	What is the Absolute Bulk Strength (ABS) of an explosive with a density of 1.2 g/cc and AWS of 780 cal/g?	2	CO2	L1
5	Mention any four circumstances where the shorter stemming length is preferred in the bench blasting.	2	CO3	L4
6	What do you understand by 'Stab holes'?	2	CO3	L4
7	Define the term 'NONEL shock tube initiation system'.	2	CO4	L5
8	List out five potential causes of the boulders produced from the blasting.	2	CO4	L3
9	Write a short note on 'WIPFRAG'.	2	CO5	L2
10	What do you mean by 'Sleeping holes'?	2	CO5	L3

PART- B (5x 13=65 Marks)

(Restrict to a maximum of 2 sub divisions)

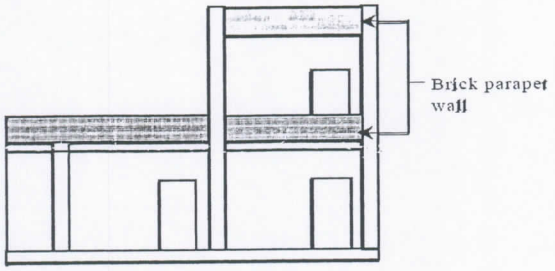
Q.No	Questions	Marks	CO	BL
11 (a)	Discuss any two types of cartridge type explosives & two bulk explosive agents used in the mines in detail with reference to its composition, characteristics, applicability, advantages and limitations.	13	CO1	L1
	OR			
11 (b)	(i) Enumerate the various testing methodologies adopted for assessing the performance of the explosives used in the mines. (ii) Explain in detail about the scattering in delay timing of delay detonator with suitable examples.	7 6	CO1	L1
12 (a)	Write a short note on: (i) Staggered pattern Vs Square/Rectangular pattern (ii) 'V' initiation technique Vs Row-by-row initiation	7 6	CO2	L6
	OR			
12 (b)	What are various controlled blasting techniques adopted in the mines and construction areas? Explain any three methods detailing its design characteristics, application, advantages and limitations with a neat sketch.	13	CO2	L6
13 (a)	Write a short note on the following: (i) Dautriche Method of VoD measurement (ii) Fragmentation prediction and assessment	7 6	CO3	L4
	OR			
13 (b)	(i) What are the precautionary measures to be observed **while blasting in hot strata (either in OB or coal)** as per the **DGMS Circular No: 2 of 1985?** (ii) Write a short note on 'High speed Videography' in blasting operation.	6 7	CO3	L4
14 (a)	An underground coal mine is being converted into an opencast mine where you are working as blasting engineer. The opencast mine is planned to be worked out with 10 m high benches employing hydraulic back hoe excavators of 5.5 m^3 for the removal of overburden consisting of **dry** shale. It has been decided to use bulk ANFO with emulsion cartridges as a primer (density of combined ANFO and the primer = 0.85 g/cm^3) in a staggered drilling pattern forming equilateral triangles with powder factor of 0.60 kg/m^3, determine the burden and spacing for the proposed vertical holes and also suggest the suitable methodology to be adopted for carrying out blasting activities over developed coal pillars with neat sketches.	13	CO4	L5
	OR			
14 (b)	A village exists at a distance of about 500 m from a big mechanised limestone quarry. The villagers complain about danger from fly rock and damage to their buildings due to the blast-induced ground & air vibration. As a Mines Manager, how will you tackle these problems? Incorporate **statutory** relevance (under MMR 1961) in the above problem, wherever is applicable.	13	CO4	L5

15 (a) (i). Discuss in detail about the underwater blasting operation adopted for harbor development considering the blast design parameters and safety precautions to be adopted during such blasting operation. **9** CO5 L3

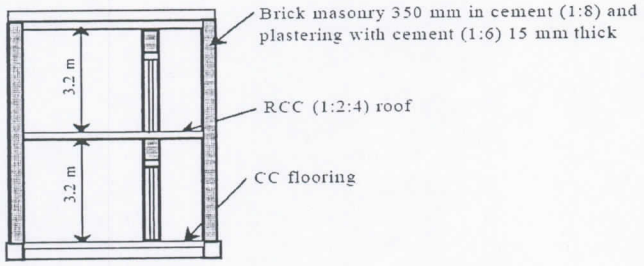
(ii) Write a short note on 'Wireless Electronic Detonators'. **4** CO5 L3

OR

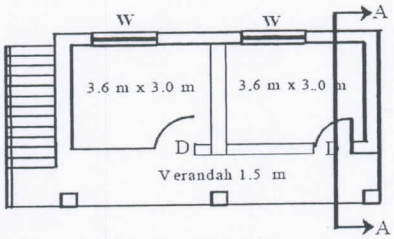
15 (b) A double storey three room building made up of brick structure with cement mortar as shown in the figure given below is situated in the new extended lease area of an operating opencast coal mine. It is required to be demolished for providing necessary area to expand the existing pit limit. **13** CO5 L3



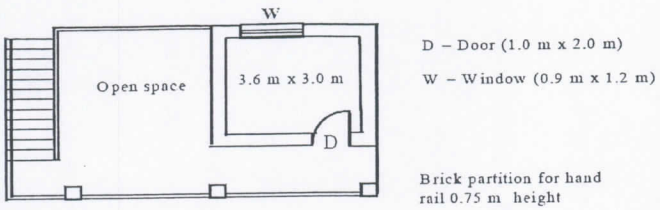
Elevation



Sectional View A-A



Ground floor plan



First floor plan

Figure not to scale

As a blasting engineer, suggest a suitable blasting design methodology to demolish the building such that it should not produce any fly rock, air blast, vibration, etc.

PART- C (1x 15=15 Marks)

(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	Enumerate the various theories of rock breakage explaining the mechanism of blasting. Discuss any three theories of rock breakage with the suitable and neat sketches	15	CO3	L4