

I B.Tech - II Semester – Regular Examinations - JULY 2024

BASIC CIVIL & MECHANICAL ENGINEERING
(Common for CE, ME, IT, AIML, DS)

Duration: 3 hours

Max. Marks: 70

Note: 1. This question paper contains two Parts: Part-A and Part-B.
2. Each Part contains:

- 5 short answer questions. Each Question carries 1 Mark and
- 3 essay questions with an internal choice from each unit. Each question carries 10 marks.

3. All parts of Question paper must be answered in one place.

BL – Blooms Level

CO – Course Outcome

PART – A

		BL	CO
1.a)	Enlist the safety measures in Civil Engineering.	L1	CO1
1.b)	Differences between substructure and super structure.	L2	CO5
1.c)	Define Surveying.	L1	CO2
1.d)	Define hydrology.	L1	CO4
1.e)	Classify types of dams.	L2	CO4

UNIT-I

		BL	CO	Max. Marks
2	a) Write short notes on scope of Civil Engineering.	L2	CO1	5 M
	b) List types of cement and explain any three of them.	L3	CO5	5 M
OR				

UNIT-II

10	a)	Differentiate between hot and cold working processes.	L2	CO2	5 M
	b)	Explain the principle of additive manufacturing technology.	L2	CO2	5 M

OR

11	a)	Explain the working of Otto cycle with the help of p-v and T-s diagrams.	L2	CO2	6 M
	b)	What are the advantages and disadvantages of electric vehicles?	L1	CO2	4 M

UNIT-III

12	a)	With neat line diagram, explain the working principle of a thermal power plant.	L2	CO3	6 M
	b)	What are different types of belt drives?	L1	CO3	4 M

OR

13	a)	Explain different types of robotic joints with line diagrams.	L2	CO3	6 M
	b)	Write any four applications of robots in industry.	L1	CO3	4 M

3	a)	List the disciplines of Civil Engineering and explain Transportation and Structural Engineering.	L2	CO1	5 M
	b)	Explain about pre-fabrication construction techniques.	L3	CO5	5 M

UNIT-II

4	a)	With neat sketches explain the principles of surveying.	L2	CO2	5 M
	b)	The following staff readings were observed successfully with level, the instrument having been moved after 3 rd , 6 th and 8 th readings; 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 meters. Enter the above readings in a page of a level book and calculate the RL of points if the first reading was taken with a staff held on bench mark of 300mt.	L4	CO2	5 M

OR

5	a)	List and explain the instruments used in surveying.	L2	CO2	5 M
	b)	Explain the characteristics of Contour Mapping.	L3	CO2	5 M

UNIT-III

6	a)	Explain the components of airport with neat sketch.	L2	CO3	5 M
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7	b)	Differentiate between Flexible and Rigid pavement.	L3	CO3	5 M
	OR				
7	a)	Explain the water quality parameters.	L2	CO4	5 M
	b)	Explain the components of dam with neat sketch.	L3	CO4	5 M

PART – B

	1.f)	Give the classification of engineering materials.	BL	CO1
	1.g)	Mention any two roles of mechanical engineer in the society.	L1	CO1
	1.h)	Define casting process.	L1	CO2
	1.i)	What is a power plant?	L1	CO3
	1.j)	Mention the configurations of robot.	L1	CO3

UNIT-I

			BL	CO	Max. Marks
8	a)	Explain the new technological developments in mechanical engineering in any two sectors.	L2	CO1	6 M
	b)	Write the applications of metals.	L1	CO1	4 M

OR

9	a)	What is the role of mechanical engineering in industries?	L1	CO1	4 M
	b)	Write a short note on engineering materials.	L1	CO1	6 M

SCHEME OF VALUATION

BASIC CIVIL & MECHANICAL ENGINEERINGPART-A

- 1a) Any Two safety measures — 1M
- 1b) substructure — 1M
superstructure — 1M
- 1c) surveying definition — 1M
- 1d) hydrology — 1M
- 1e) Any 2 types — 1M

UNIT-I

- 2) a) Explanation about scope of civil Engineering — 5M
- 2) b) Any Three types of cement — 5M
- 3) a) List of disciplines of civil Engineering — 1M
Explanation about structural Engineering — 2M
" " Transportation " — 2M
- b) Explanation about Prefabrication — 5M

UNIT-II

- 4) a) principles of surveying — 5M
& Neat sketches
- b) Placing of values in table — 2M
Calculation — 2M
check — 1M
5M

5) a) List of instruments - 1M

Explanation of instrument - 4M
5M

b) Characteristics of contour mapping - 5M

UNIT-III

6) a) List components of airport - 1M

Explanation of components - 3M

Sketch - 1M

5M

b) Any 6-8 points explanation - 5M

7) a) water quality parameters - 5M

components of dam - 1M

Sketch - 4M

10M

PART-A

1.a) Enlist the safety measures in civil engineering?

- Personal Protective Equipment (PPE)
- Follow Environmental Guidelines.
- Keep the Work Area Clean.
- Ladder Safety.
- No Crowding inside the Site Perimeter.
- Lifting Precautions.
- Proper Site Training.
- Safety Programs and Culture.

1 b) Differences between substructure and superstructure?

The superstructure and the substructure are essential components of a building. The superstructure is the **visible part of a building** that sits above ground. It starts from the ground floor to the top of the building, while the **substructure is the portion below the soil, that is, the foundation**

1c) Define Surveying?

Two-dimensional or three-dimensional positions of points and the distances and angles between them.

1d) Define hydrology?

Hydrology is the study of the distribution and movement of water both on and below the Earth's surface, as well as the impact of human activity on water availability and conditions.

1e) classify types of dams?

- Diversion Dam.
- Buttress Dam.
- Embankment Dam.
- Cofferdam.
- Storage Dam.
- Gravity Dam.

UNIT-1

2 a) Write short notes on scope of civil Engineering?

Structural Engineering

Structural analysis and designing of slabs, columns, beams etc for constructional projects which requires calculation and the use of advanced computing software fall under the category of structural engineering.

Geotechnical Engineering

It is the field of civil engineering which deals with collection and testing of soil samples. Geotechnical engineers design and construct well foundations, pile foundations, cofferdams, tunnels, caissons, and earth-related constructions.

Water Resources Engineering

Water Resource Engineering includes designing hydraulic structures like canals, barrages, dams, hydropower stations, pipe networks etc to measure, utilise and develop water resources for municipal, agriculture and power generation purpose. It also includes water harvesting techniques, watershed planning, soil conservation etc.

Environmental Engineering

Due to increased human activities, it is very important to safeguard the natural world. This field deals with public health engineering and pollution control through the construction of a sewerage system, water distribution plant and also solid waste management.

2b) List types of cement and explain any three of them?

Types of Cement:

Rapid-hardening Cement: This cement is similar to the ordinary Portland cement. As the name suggests, it develops strength rapidly. The rapid rate of strength development is attributed to the higher fineness of grinding. This cement is used where high strength is required instantly in initial stages.

Sulphate-resisting Cement : Ordinary Portland cement has less resistance to the attacks of sulphates. This type of cement with higher silicate content is effective in fighting back the attacks of sulphates. This is used for the construction of sewage treatment works, marine structures and foundations in soils having large sulphate content.

Low-heat Cement: This cement hardens slowly but produces less heat than the other cements while reacting with water. This can be used in mass concreting works like construction of dams, etc.

Quick-setting Cement
Portland pozzolana Cement
High-alumina Cement
Air-entraining Cement
Masonry Cement
Expansive Cement
Hydrophobic Cement
Coloured Cement
White Cement
High-strength Cement

3 a) List the disciplines of civil engineering and explain transportation and structural engineering?

1. Structural engineering
2. Geotechnical engineering
3. Fluid mechanics, hydraulics and hydraulic machines
4. Transportation engineering
5. Water supply, sanitary and environmental engineering

Structural engineering:

Structural engineering is the most important specialization in civil engineering. The construction of a structure needs efficient planning, design and method of construction to serve the purpose fully. Generally there are five major steps in any construction project. These include the following:

1. Positioning and arranging the various parts of the structure into a definite form to achieve best utilization.
2. Finding out the magnitude, direction and nature of various forces acting on the structure.
3. Analyzing the structure to know the behaviour of the various parts of the structure subjected to the above forces.
4. Designing the structure such that its stability under the action of various loads is ensured.
5. Executing the work with selected construction materials and skilled workers.

Transportation Engineering:

The development of a nation mainly depends on the communication facilities available. A nation's wealth is measured in terms of the road and railway facilities available. There are three modes of transportation, viz. land, water and air. This specialisation deals with the design, construction and execution of the communication routes.

The different branches of transportation engineering include the following: highway engineering deals with the planning and designing of roads, railway engineering deals with the railway tracks, harbour engineering deals with the harbours and airport engineering deals with the airports.

3 b) Explain about prefabrication construction techniques?

- Modular construction is the process of constructing full modules in a factory, complete with finishes and utilities. These modules are then transported and assembled on-site to form a fully working structure. Modular construction is appropriate for a wide range of structures, including homes, hotels, businesses, and educational institutions.
- Panelized construction entails the manufacturing factory of wall panels, floor panels, and roof trusses. These panels are then delivered to the construction site and assembled to form the structural frame of the structure. Residential and light commercial constructions frequently employ panelized construction.

4 a) With neat sketches explain the principles of surveying?

To get accurate results in surveying one should follow the following fundamental principles:

- (i) Work from whole to part
- (ii) Take extra care in fixing new control points.

Work from Whole to Part:

In surveying large areas, a system of control points is identified and they are located with high precision. Then secondary control points are located using lesser precise methods. The details of the localized areas are measured and plotted with respect to the secondary control points. This is called working from whole to part. This principle in surveying helps in localizing the errors. If the surveying is carried out by adding localized areas errors accumulated and may become unacceptable when large area is covered.

Extra Care in Fixing New Control Points

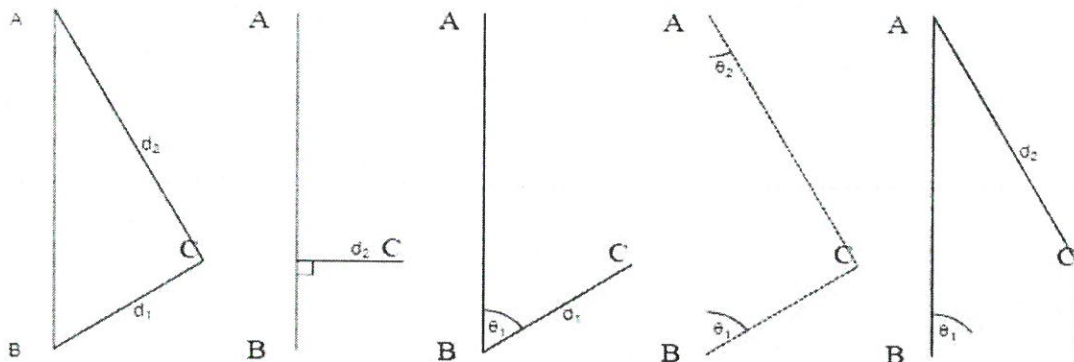


Fig. 1 Locating point C w.r.t. points A and B

Figure 1 shows the various methods of fixing point C with respect to already fixed points A and B by measuring sides, angles or setting perpendiculars. For fixing new control points (stations) with respect to already fixed points at least two independent process should be followed. If A and B are already located control points and with respect to them new control point C is to be located, apart from the minimum measurements required as shown in Fig. 1, one more measurement should be taken. Measuring the lengths of check lines and tie lines will also serve this purpose (Ref. Fig. 2).

4b)

B.S	I.S	F.S	H.I	R.L
2.228			302.228	300
	1.606			300.622
2.090		0.988	303.33	301.24
	2.864			300.466
0.602		1.262	302.67	302.068
1.044		1.982	301.732	300.688
		2.684		299.048

$$\begin{aligned} & \sum B.S - \sum F.S \\ & = 5.964 - 6.916 \\ & = -0.952 \end{aligned}$$

$$\begin{aligned} & \text{Last R.L} - \text{first R.L} \\ & = 299.048 - 300 \\ & = -0.952 \end{aligned}$$

5 a) List and explain the instruments used in surveying?

Based on the instruments used, surveying may be classified as:

(i) **Chain survey :**

The chain is generally composed of 100 or 150 links. The links are formed by pieces of galvanised loops and connected together by means of three oval-shaped rings. The ovalshaped rings afford flexibility to the chain. In good-quality chains, the joints of links are welded so that change in length will be reduced considerably due to stretching. The ends of the chain are provided with brass handles with swivel joints so that the chain can be turned round without twisting.

(ii) **Compass survey :** Compass is an instrument which can be used to measure the direction of a survey line with respect to magnetic north-south. The magnetic north-south direction which is the reference direction is called meridian (reference direction) and the angle between the line and the meridian is called bearing. Use of compass for measuring direction of line simplifies the surveying to a great extent.

(iii) Plane table survey

(iv) Theodolite survey

(v) Tacheometric survey

(vi) Modern survey using electronic distance meters and total station

5 b) Explain the characteristics of contour mapping?

The contours have the following characteristics:

1. Contour lines must close, not necessarily in the limits of the plan.
2. Widely spaced contour indicates flat surface.
3. Closely spaced contour indicates steep ground.
4. Equally spaced contour indicates uniform slope.
5. Irregular contours indicate uneven surface.
6. Approximately concentric closed contours with decreasing values towards centre indicate a pond.
7. Approximately concentric closed contours with increasing values towards centre indicate hills.
8. Contour lines with U-shape with convexity towards lower ground indicate ridge
9. Contour lines with V-shaped with convexity towards higher ground indicate valley
10. Contour lines generally do not meet or intersect each other.
11. If contour lines are meeting in some portion, it shows existence of a vertical cliff
12. If contour lines cross each other, it shows existence of overhanging cliffs or a cave

6 a) Explain the components of airport with neat sketch?

Components of Airport

Therefore, the main components of airport are

1. Runway
2. Terminal Building
3. Apron
4. Taxiway
5. Aircraft Stand
6. Hanger
7. Control Tower
8. Parking

Runways: It is the most important part of an airport in the form of paved, long and narrow rectangular strip which actually used for landing and takeoff operations. It has turfed (grassy) shoulders on both sides. The width of runway and area of shoulders is called the landing strip. The runway is located in the centre of landing strip.

Terminal Buildings: Also known as airport terminal, these buildings are the spaces where passengers board or alight from flights. These buildings house all the necessary facilities for passengers to check-in their luggage, clear the customs and have lounges to wait before disembarking..

Hangers: A hangar is a closed building structure to hold aircraft, spacecraft or tanks in protective storage. Most hangars are built of metal, but other materials such as wood and concrete are also used Hangars are used for protection from the weather, direct sunlight, maintenance, repair, manufacture, assembly and storage of aircraft on airfields, aircraft carrier.

Aprons: Aircraft aprons are the areas where the aircraft park. Aprons are also sometimes called ramps. They vary in size, from areas that may hold five or ten small planes, to the very large areas that the major airports have.

Taxiway: Taxiway is the paved way rigid or flexible which connects runway with loading apron or service and maintenance hangers or with another runway. They are used for the movement of aircraft on the airfields for various purposes such as exit or landing, exit for takeoff etc.

6 b) Differentiate between Flexible and Rigid Pavements?

S.No.	Flexible Pavement	Rigid Pavement
1.	It transfers the wheel load to subgrade by grain-to-grain mechanism.	It transfers the wheel load to subgrade by slab action.
2.	The initial construction cost is low.	The initial construction cost is high.
3.	It doesn't require joints.	It requires joints.
4.	Durability is low.	Durability is high.
5.	It doesn't distribute load uniformly. So, a good subgrade is required.	It distributes wheel load uniformly. So, there is no requirement for a good subgrade.
6.	There is no effect of temperature variation on stress variation.	Temperature variation affects the stress variation.
7.	The lifespan of flexible pavement is approximately 10 to 15 years.	The maximum lifespan of rigid pavement is approximately 20 to 30 years or more.
8.	Repair work is simple.	Repair work is complex.
9.	The maintenance cost is high.	The maintenance cost is low.
10.	It doesn't require curing.	It requires curing.
11.	Poor night visibility due to the use of asphalt.	Good night visibility due to the use of concrete.
12.	No glare due to sunlight. (Glare: Shine with a solid or dazzling light.)	High glare due to sunlight.

7 a) Explain the water quality parameters?

The aim of water treatment is to produce and maintain water that is hygienically safe, aesthetically attractive and palatable in an economic manner.

The method of treatment to be employed depends on the nature of raw water and desired standard of water quality. The unit operations in water treatment are given below:

1. Aeration
2. Coagulation
3. Flocculation
4. Sedimentation
5. Filtration
6. Softening
7. Disinfection
8. De-mineralisation
9. De-fluoridation

7 b) Explain the components of dam with neat sketch?

The water-retaining structure is the dam's walled structure that resists water while allowing a controlled amount to flow downstream. Accordingly, the side of the barrier where water is collected is known as the upstream side, and where the water flows is known as the downstream side. Generally, the following component of dams makes up the dam's water-retention section

- Heel
- Toe
- Abutment
- Crest
- Cutoff
- Parapet wall

- **Toe**

The portion of the dams meeting with the groundwater or downstream side is called the Toe. (Ref fig)

- **Abutment**

Abutments support the lateral pressure. These are the sides of the valley. These are concrete or masonry structures.

- **Crest/Roadway of Dams**

The section of the dams used as a roadway or walkway is the crest. It is the upper area of the dam.

- **Cut off**

The cut-off is an impervious barrier constructed beneath the

