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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS INSTITUTION)

B. Tech III Year II Semester (R23) Regular End Semester Examinations, May 2026

Design of Steel Structures
(Department of Civil Engineering)

Time: 3Hrs

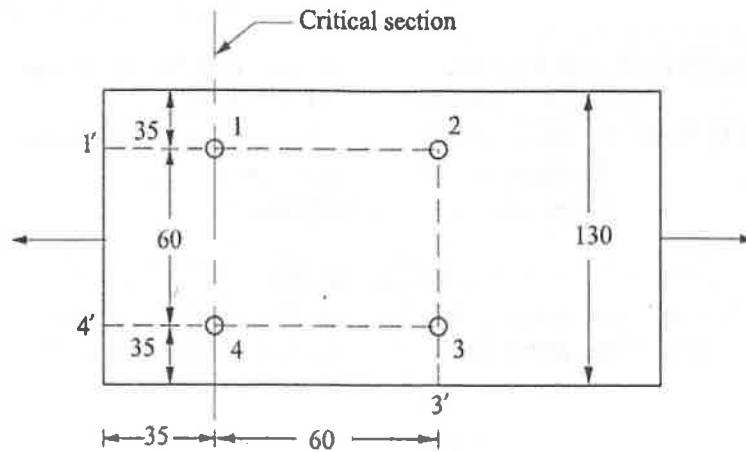
Max Marks: 70M

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

IS 800 2007 and Steel Tables are permitted to use in the Exam. Assume Suitable data if

S. No.	Question	Marks	CO	BL
1.	i) Define the meaning of the I.S. rolled section.	1	1	1
	ii) Write the correct partial safety factor for material strength of steel as per IS 800:2007.	1	1	1
	iii) Define a tension member.	1	2	1
	iv) Explain the factor affecting the net effective area of a tension member.	1	2	1
	v) The primary parameter governing buckling of compression members.	1	3	1
	vi) What are the different types of column base connections?	1	3	1
	vii) State the concept of a plastic hinge.	1	4	1
	viii) What are the failure modes occurred in the plate girder?	1	4	1
	ix) List the types of roof trusses	1	5	1
	x) The primary type of loading to which purlins are subjected?	1	5	1
2(A)	(i) Explain the concept of Limit State Design of steel structures. Highlight its advantages over the Working Stress Method.	6	1	2
	(ii) Describe the types of structural steel used in construction and explain their important mechanical properties.	6	1	2
OR				
2(B)	Design a bolted lap joint to transfer a factored tensile load of 360 kN between two steel plates of size 16 mm thick × 200 mm wide. Use bearing type bolts of grade 4.6 and structural steel conforming to Fe 410. Additional Data:	12	1	6
	<ul style="list-style-type: none"> Assume suitable bolt diameter Edge distance and pitch as per IS 800:2007 Failure modes to be checked: <ul style="list-style-type: none"> Shear of bolts Bearing on plate Net section failure 			
	Requirements:			
	1. Calculate the design strength of a single bolt.			
	2. Determine the number of bolts required.			
	3. Check joint efficiency.			
	4. Draw a neat labelled sketch of the bolted lap joint showing pitch, gauge, and edge distances.			
3(A)	(i) Explain the various modes of failure of tension members with suitable sketches.	4	2	2
	(ii) Determine the design tensile strength of the plate 130 mm × 12 mm with the holes for 16 mm diameter bolts as shown in Figure below. Steel used is of Fe 410 grade quality. Also Determine the efficiency of the tension member.	8	2	4



OR

3(B) Design a single angle tension member to carry a factored axial tensile load of 420 kN. 12 2 6

The member is connected to a gusset plate through one leg using bolts.
Given / Assumptions:

- Steel grade: Fe 410
- Bolts: Bearing type bolts, grade 4.6
- Assume suitable bolt diameter and connection details

Requirements:

1. Select a suitable angle section.
2. Check the strength of the member against:
 - Yielding of gross section
 - Rupture of net section
 - Block shear failure
3. Check adequacy considering shear lag effect.
4. Draw a neat labelled sketch of the tension member with gusset plate and bolt arrangement.

4(A) (i)	Define and classify a built-up compression member with a neat diagram..	4	3	2
(ii)	Explain the design procedure for the design of a laced compression member as per IS 800: 2007.	8	3	2

OR

4(B) (i) Design a steel column subjected to a factored axial compressive load of 850 kN. 12 3 6

The column has an effective length of 4.2 m and is hinged at both ends.

Given / Assumptions:

- Steel grade: Fe 410
- Column is laterally supported
- Assume suitable rolled steel section

Requirements:

1. Select a suitable standard rolled steel section.
2. Calculate the slenderness ratio for both principal axes.
3. Determine the design compressive strength as per IS 800:2007.
4. Check the safety of the column.
5. Draw a neat sketch showing column, end conditions, and buckling axis.

5(A)	Design a suitable I beam for a simply supported span of 3 m with a subjected dead load of 17.78 kN/m and live load of 40 kN/m. Assume the beam as a fully lateral restraint & stiff bearing support of 150 mm.	12	4	6
OR				
5(B) (i)	Explain the design procedure for the design of welded plate girder as per IS 800: 2007.	8	4	2
(ii)	Define built-up beam with diagram and which situation may use built-up beam.	4	4	2
6(A) (i)	Explain the components of a Pre-Engineered Building (PEB) with neat sketches.	6	5	3
(ii)	Describe the different types of roof trusses used in industrial buildings.	6	5	2
OR				
6(B)	Design a steel purlin using an angle section for an industrial building roof structure. Given:	12	5	6

- Truss spacing = 4.5 m
- Purlin spacing = 1.6 m
- Roof slope = 25°
- Dead load on roof = 0.55 kN/m²
- Live load on roof = 0.75 kN/m²
- Steel grade = Fe 410

Requirements:

1. Calculate the load acting on the purlin.
2. Resolve loads into normal and parallel components to roof slope.
3. Select a suitable angle section.
4. Check the purlin for bending about both axes.
5. Draw a neat labelled sketch showing purlin orientation and loading.

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS INSTITUTION)

B. Tech III Year II Semester (R23) Regular End Semester Examinations, May 2026

Highway Engineering
(Department of Civil Engineering)

Time: 3Hrs

Max Marks: 70M

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

S. No.	Question	Marks	CO	BL
1.	i) Name different road networks.	1	1	1
	ii) Name the factors effecting highway alignment.	1	1	1
	iii) What is OSD?	1	2	1
	iv) Explain why superelevation need to be provided at horizontal curves.	1	2	1
	v) How to find journey speed?	1	3	1
	vi) What is difference between accident and incident?	1	3	1
	vii) What are the different radii that needs to designed in traffic rotary?	1	4	1
	viii) Name any 2 types of interchanges.	1	4	1
	ix) Name the IRC codes used for flexible and rigid pavement design.	1	5	1
	x) Abbreviate WBM and WMM.	1	5	1
2(A)	Discuss various road classifications and their significance in India	12	1	2
	OR			
2(B)	Describe the engineering surveys for highway alignment, including drawings and reports.	12	1	2
3(A)	A horizontal curve is to be designed for a design speed of 100 km/h. The maximum superelevation is limited to 0.07 and the side friction factor is 0.12. Determine the minimum radius of the curve. Further, evaluate how the radius would change if the design speed is increased to 120 km/h and discuss the implications for highway design.	12	2	3
	OR			
3(B)	Describe the various elements of a highway cross section and explain their functional importance.	12	2	2
4(A)	Explain traffic volume studies in detail. Discuss the objectives, methods of data collection and methods of data presentation.	12	3	2
	OR			
4(B)	Examine the reasons behind road accidents and outline the preventive actions that can be taken to enhance road safety.	12	3	2
5(A)	Explain about traffic rotary in detail with neat sketch.	12	4	2
	OR			
5(B)	Discuss principles and objectives of channelization.	12	4	2
6(A)	A tandem axle carries two axles each with dual wheels, where each wheel carries 30 kN. The spacing between the axles is 1.2 m and the spacing between wheels is 300 mm. Determine the equivalent single wheel load at a depth of 300 mm. Evaluate the effect of axle spacing on ESWL and its significance in pavement thickness design.	12	5	3
	OR			
6(B)	Calculate the stresses at interior, edge and corner regions of a rigid pavement using westergaard's stress equation for following data: wheel load of 5100kg, elastic modulus of concrete is 3×10^5 kg/cm ² . Pavement thickness is 18 cm and poisson's ratio is 0.15. k value is 6 kg/cm ³ and radius of contact area is 15cm.	12	5	3

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS INSTITUTION)

B. Tech III Year II Semester (R23) Regular End Semester Examinations, May 2026

Construction Planning and Management

(Department of Civil Engineering)

Time: 3Hrs

Max Marks: 70M

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

S. No.	Question	Marks	CO	BL																																				
1.	i) Define a work task in a construction management	1M	1	1																																				
	ii) What are precedence relationships among activities	1M	1	1																																				
	iii) Define construction scheduling and its importance.	1M	2	1																																				
	iv) Define the Critical Path Method (CPM)	1M	2	1																																				
	v) Define Information Technology (IT) in the construction management.	1M	3	1																																				
	vi) What is the role of GIS in construction?	1M	3	1																																				
	vii) Define quality control in the context of construction.	1M	4	1																																				
	viii) What is meant by safety concerns in construction?	1M	4	1																																				
	ix) Define the term project information and give an example of its use.	1M	5	1																																				
	x) What is the role of computerized database management systems and distributed systems?	1M	5	1																																				
2(A)	Discuss the factors influencing the choice of technology and construction methods and their impact on project efficiency.	12M	1	2																																				
	OR																																							
2(B)	Explain the technology choice can influence the development and execution of a construction plan.	12M	1	2																																				
3(A)	Discuss the Critical Path Method (CPM) and its importance in construction project scheduling. And how time estimates (mean, variance, and standard deviation).	12M	2	3																																				
	OR																																							
3(B)	The project has eleven activities, and the expected time of each activity is given	12M	2	3																																				
	<table><tr><th>S. No</th><th>Activity</th><th>Duration in days</th></tr><tr><td>1</td><td>1-2</td><td>5</td></tr><tr><td>2</td><td>2-3</td><td>12</td></tr><tr><td>3</td><td>2-4</td><td>17</td></tr><tr><td>4</td><td>3-5</td><td>26</td></tr><tr><td>5</td><td>4-5</td><td>6</td></tr><tr><td>6</td><td>4-7</td><td>8</td></tr><tr><td>7</td><td>3-6</td><td>12</td></tr><tr><td>8</td><td>5-7</td><td>18</td></tr><tr><td>9</td><td>5-8</td><td>16</td></tr><tr><td>10</td><td>6-8</td><td>8</td></tr><tr><td>11</td><td>7-8</td><td>12</td></tr></table>	S. No	Activity	Duration in days	1	1-2	5	2	2-3	12	3	2-4	17	4	3-5	26	5	4-5	6	6	4-7	8	7	3-6	12	8	5-7	18	9	5-8	16	10	6-8	8	11	7-8	12			
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	below:																																							
	(a) Draw a network diagram																																							
	(b) Identify the critical path																																							
	(c) Calculate EST, EFT, LST & LFT																																							
4(A)	Explain the benefits of cloud-based database management systems in the construction industry.	12M	3	3																																				

OR				
4(B)	Explain the role of Information Technology (IT) in construction and its impact on productivity and efficiency.	12M	3	3
5(A)	Explain the process of organizing for quality and safety in construction projects, including key roles and responsibilities.	12M	4	3
OR				
5(B)	Describe the use of statistical methods for quality control in construction projects, emphasizing their effectiveness.	12M	4	3
6(A)	Describe the relational model of databases with a suitable example, and discuss its application in organizing project information	12M	5	3
OR				
6(B)	Discuss the types of project information commonly utilized in project management. Highlight their importance and accuracy considerations.	12M	5	3

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS INSTITUTION)

B. Tech III Year II Semester (R23) Regular End Semester Examinations, May 2026

Foundation Engineering
(Department of Civil Engineering)

Time: 3Hrs

Max Marks: 70M

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

S. No.	Question	Marks	CO	BL
1.	i) Distinguish between disturbed and undisturbed samples?	1M	1	1
	ii) Explain the earth pressure in at rest condition	1M	1	1
	iii) Define infinite earth slopes with suitable examples	1M	2	1
	iv) What are types of slope failures?	1M	2	1
	v) Mention different types of shallow foundation	1M	3	1
	vi) Explain General Shear failure of foundation	1M	3	1
	vii) Classify piles based on their method of installation.	1M	4	1
	viii) Name the situations where pile foundations are preferred?	1M	4	1
	ix) Describe about Under reamed piles	1M	5	1
	x) What are the forces acting on well foundation?	1M	5	1
2(A)	(i) Explain the purpose of providing soil exploration	6M	1	2
	(ii) Write short notes on Augur boring	6M	1	2
OR				
2(B)	A 10m high retaining wall with smooth vertical back supports a horizontal backfill ($\phi = 33^\circ$, $c = 25\text{kPa}$, Density above water table 15kN/m^3 and below water table 18kN/m^3). The water table is at a depth of 3m below the surface of the backfill. Determine the magnitude and line of action of passive earth pressure	12M	1	4
3(A)	(i) What is stability number? What is its utility in the analysis of slopes?	6M	2	2
	(ii) Explain different modes of slope failures with suitable reasons	6M	2	2
OR				
3(B)	Derive an expression for factor of safety of an infinite slope in cohesive soils.	12M	2	3
4(A)	(i) Differentiate between shallow foundation and the deep foundation.	6M	3	2
	(ii) Discuss the procedure for the design of Rectangular combined footing.	6M	3	2
OR				
4(B)	(i) A 2m wide square footing is laid at a depth of 1.2 m below the GL on a C- ϕ soil with $c=40\text{ kPa}$ and $\phi=20^\circ$, $\gamma=17\text{kN/m}^3$, Given $NC=11.80$. $N_q=3.90$, $N_\gamma=1.70$. Using Terzaghi's theory, compute the ultimate bearing capacity when the GWT is, a) 1.5 m below G.L b) At G.L c) 2 m below G.L	12M	3	3
5(A)	(i) Write short note on Efficiency of Pile Groups.	6M	4	2
	(ii) Explain about Under-reamed piles with neat sketch	6M	4	2
OR				

5(B)	A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30 cm and 9 m respectively. If the unconfined compression strength of the clay is 90 kN/m ² , and the pile spacing is 90 cm center to center, what is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75.	12M	4	4
6(A)	(i) Discuss the various forces acting on a well foundation.	6M	5	2
	(ii) Explain the step involved in the sinking of a well foundation.	6M	5	2
OR				
6(B)	Explain with neat sketch different components of wells and their functions listing advantages and disadvantages.	12M	5	2

*****END*****

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS INSTITUTION)

B. Tech III Year II Semester (R23) Regular End Semester Examinations, May 2026**Watershed Management**

(Department of Civil Engineering)

Time: 3Hrs**Max Marks: 70M**

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

S. No.	Question	Marks	CO	BL
1.	i) What are watershed boundaries and how are they defined in planning?	1	1	1
	ii) What roles do stakeholders play in the decision-making process?	1	1	1
	iii) What are the erosion factors contributing to watershed degradation?	1	2	1
	iv) How can the impacts of sediment yield be assessed?	1	2	1
	v) How can the performance of check dams in groundwater recharge be evaluated?	1	3	1
	vi) What are percolation tanks?	1	3	1
	vii) What is meant by a wetland ecosystem?	1	4	1
	viii) How can hydrologic modeling be evaluated?	1	4	1
	ix) What is meant by the conjunctive use of water resources in agriculture?	1	5	1
	x) How can drought conditions be measured and assessed?	1	5	1
2(A)	(i) What are the various watershed management practices?	6	1	2
	(ii) What plans can be developed to address the challenges in watershed management?	6	1	2
OR				
2(B)	How to develop the recycling and reuse strategies in watershed management systems.	12	1	2
3(A)	(i) What is soil erosion and what are its major types?	6	2	2
	(ii) What are the different factors affecting soil erosion, and how do their combined effects influence the rate of erosion?	6	2	2
OR				
3(B)	Explain the role of wetlands in sediment transport and nutrient cycling, illustrating your answer with neat sketches.	12	2	2
4(A)	(i) Explain the principles and importance of rainwater harvesting in water resource management.	6	3	2
	(ii) Describe catchment harvesting techniques and discuss their role in improving water availability in rural areas.	6	3	2
OR				
4(B)	Assess the effectiveness of water harvesting techniques in drought-prone areas.	12	3	3
5(A)	(i) Explain the fundamentals involved in the design of wetland treatment systems.	6	4	2
	(ii) Discuss rainwater harvesting techniques and their importance in sustainable water management.	6	4	2
OR				
5(B)	Evaluate impacts of climate change on wetlands.	12	4	3
6(A)	(i) What are the different irrigation water management strategies?	6	5	1
	(ii) Evaluate the effectiveness of irrigation water management strategies.	6	5	3

OR

- | | | | | |
|----------|--|---|---|---|
| 6(B) (i) | Differentiate between blue, green, and grey water footprints with suitable examples. | 6 | 5 | 2 |
| (ii) | Discuss the significance of water footprint assessment in improving agricultural water efficiency. | 6 | 5 | 2 |

END