

CBCS SCHEME

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21CV43

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Public Health Engineering

Time: 3 hrs.

Max. Marks: 100

Note : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. List and explain the types of water demand. (06 Marks)
 b. What is design period? Discuss the factors governing the design period. (07 Marks)
 c. In a town, it has been decided to provide 200 l / head / day in the 21st century. Estimate the domestic water requirements of this town in the year 2000 by projecting of population of town by the incremental increase method from the data given below :

Year	1940	1950	1960	1970	1980
Population	250000	480500	550300	638600	695200

(07 Marks)

OR

- 2 a. What is sampling? List the sampling techniques and explain each. (07 Marks)
 b. What is population forecasting? List the methods of population forecasting. Explain incremental increase method and comparative graphical method. (07 Marks)
 c. Mention the permissible limits as per BIS of the following water quality parameters and write the problem caused if the limit is exceeded.
 i) Fluoride ii) Nitrate iii) Turbidity. (06 Marks)

Module-2

- 3 a. Explain with a flow diagram indicating the various steps of water treatment and state the significance of each unit. (08 Marks)
 b. A water has to purify for a town whose daily demand is 8 MLD. Design a suitable sedimentation tank filled with mechanical sludge removal.
 Assume velocity of flow = 22 cm/min, detention period = 8 hrs. (08 Marks)
 c. Explain the terms i) Sedimentation with coagulation ii) Back washing. (04 Marks)

OR

- 4 a. Design 6 slow sand filter bed from the following data :
 Population = 40000 , Per capita demand = 150 L/h/d , Rate of filtration = 180 L/hr/m² ,
 Length of each bed = twice the breadth. Assume maximum demand ad 1.8 times the average daily demand and also assume that 1 unit out of 6 will be kept as stand by. (10 Marks)
 b. List and explain the filter troubles in filtration. (10 Marks)

Module-3

- 5 a. List and explain the forms of chlorination. (10 Marks)
 b. With a neat sketch, explain the working process of Zeolite with reactions. (10 Marks)

OR

- 6 a. List and explain the systems of sewage. Explain each with its advantages and disadvantages. (10 Marks)
- b. The BOD of sewage incubated for 1 day at 30 °C has been found to be 110 mg/l. What will be the 5 day 20 °C BOD? Assume $K_1 = 0.1$ at 20 °C. (06 Marks)
- c. Define the terms :
- i) BOD ii) Turbidity of sewage. (04 Marks)

Module-4

- 7 a. Draw a neat flow diagram and explain the municipal waste water treatment unit operations and process. (10 Marks)
- b. Write a note on necessity of sedimentation tanks. Explain the types along with a neat sketch of rectangular settling tank. (10 Marks)

OR

- 8 a. Explain the working of conventional activated sludge process with flow diagram. (10 Marks)
- b. Draw a neat sketch of oil and grease removal tank and write the reasons for excluding grease and oil. (10 Marks)

Module-5

- 9 a. Determine the size of high rate trickling filter for the following data :
- i) Sewage flow = 4.5 MLD
- ii) Recirculation ratio = 1.5
- iii) BOD of raw sewage = 250 mg/l
- iv) BOD removal in primary tank = 30%
- v) Final effluent BOD desired = 30 mg/l. (10 Marks)
- b. Explain with a neat sketch, process of stabilization pond and also explain the types of stabilization pond. Write the advantages and disadvantages of the same. (10 Marks)

OR

- 10 Write a note on :
- a. Rotating biological contactors.
- b. Sludge digesters.
- c. Suspended growth system and attached growth.
- d. Oxidation ditch. (20 Marks)

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21CV52

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026 Transportation Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data suitably.*

Module-1

- 1 a. Explain the characteristics of Road transport. (08 Marks)
b. Summarize the important recommendations made by Jayakar Committee. (06 Marks)
c. Explain briefly the objects of highway planning. (06 Marks)

OR

- 2 a. Explain the factors controlling highway alignment. (10 Marks)
b. Explain briefly stages of engineering surveys conducted for highway alignment. (06 Marks)
c. Evaluate the lengths of NH and SH required in a district with a total area of 5800 km², developed, Semi-developed and undeveloped areas being 25, 35 and 40% of the district. The number of towns with population over 1.0, 0.5-1.0, 0.2-0.5 and 0.1-0.2 lakhs are 3, 7, 12 and 20 respectively in the district. Use the formulas :

$$NH = \left[\frac{A}{64} + \frac{B}{80} + \frac{C}{96} + 32K + 8M \right] + D$$

$$NH + SH = \left[\frac{A}{20} + \frac{B}{24} + \frac{C}{32} + 48K + 24M + 11.2N + 1.6P \right] + D \quad (04 \text{ Marks})$$

Module-2

- 3 a. Explain briefly highway geometric design factors. (10 Marks)
b. Evaluate safe overtaking sight distance and minimum length of overtaking zone. If the speeds of overtaking and overtaken vehicles are 22.22 m/sec and 11.11 m/sec respectively on a two way traffic road. The average acceleration during overtaking may be assumed as 0.90 m/sec² and reaction time of overtaking vehicle as 2 seconds. (10 Marks)

OR

- 4 a. Summarise the factors affecting pavement surface skid resistance or friction. (08 Marks)
b. Explain types of gradients in the design of vertical alignment of roads. (04 Marks)
c. In a heavy rainfall area, two types of road pavement are to be constructed,
(i) Two-lane SH with bituminous concrete surface of 7 m.
(ii) MDR of WBM pavement of 3.8 m wide.

Evaluate the height of crown with respect to edges for above cases, assuming straight line camber and range of camber in heavy rainfall areas for BC surface as 1 in 50 or 2% and for WBM as 1 in 33 or 3%. (08 Marks)

Module-3

- 5 a. Explain the desirable properties of road aggregates and list the various tests conducted on aggregates. (10 Marks)
b. Differentiate between flexible and rigid pavement. (10 Marks)

OR

- 6 a. Explain briefly desirable properties of bituminous binders and list tests conducted on bituminous binders. (10 Marks)
- b. Explain the construction of embankment and preparation of subgrade for flexible pavement construction. (10 Marks)

Module-4

- 7 a. Explain any five (5 nos.) requirements and importance for highway drainage. (10 Marks)
- b. The distance between the farthest point in the turf covered drainage area of average slope of 1.5% towards drain and the point of entry to side drain in 200 m is 33 min. The weighted average value of run-off coefficient is 0.25. The length of longitudinal open drain in a clayey soil from the inlet point to the cross drainage is 540 m. The velocity of flow in the side drain assumed as 0.6 m/sec, so that silting and erosion are prevented. Estimate the design capacity of flow on the side drain for 10 years period of frequency of occurrence of storm corresponding to 48 min is 70 mm/hr. (06 Marks)
- c. Explain briefly the common types of culverts used as cross drainage structures. (04 Marks)

OR

- 8 a. What are the factors to be considered for evaluation of Vehicle Operating Cost (VOC). (08 Marks)
- b. List the methods of economic analysis and explain briefly Rate of return method. (06 Marks)
- c. Differentiate the annual cost of a two lane road for two types of pavement structures :
- (i) WBM with thin bituminous surface at total cost of Rs.108 lakhs per km, life of 5 years, interest at 10%, Salvage value of Rs.10 lakhs after 5 years, annual average maintenance cost of Rs. 0.35 lakhs per km.
- (ii) Bituminous Macadam base and bituminous concrete surface, total cost of Rs.197 lakhs, life of 15 years, interest at 8%, Salvage value of 25 lakhs at the end of 15 years, annual average maintenance cost Rs.0.75 lakhs per km. (06 Marks)

Module-5

- 9 a. Explain briefly road user characteristic factors. (08 Marks)
- b. What are the various traffic engineering studies carried out for collecting traffic data. (04 Marks)
- c. Explain the traffic regulation and control for safe traffic operation. (08 Marks)

OR

- 10 a. Draw a neat sketch of airport layout with component parts and explain function of each component. (10 Marks)
- b. Explain the requirements of ballast materials used for railway track construction. (10 Marks)

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21CV651

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026 Remote Sensing and GIS

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is Remote Sensing? Discuss processes of remote sensing with a neat sketch. (08 Marks)
- b. With a neat sketch of Electromagnetic spectrum. Explain various wavelength ranges useful in the process of remote sensing. (08 Marks)
- c. What is atmospheric window? How it will influence the process of remote sensing. (04 Marks)

OR

- 2 a. Describe various resolutions of a sensor used in remote sensing system with suitable example. (08 Marks)
- b. Describe various key element of visual interpretation technique. (08 Marks)
- c. Describe briefly various platforms used in remote sensing. (04 Marks)

Module-2

- 3 a. What is Photogrammetry? Describe briefly various types of Photogrammetry, list the advantages of Photogrammetry. (08 Marks)
- b. What is aerial Photogrammetry? Describe advantages of aerial Photogrammetry over ground survey methods? (08 Marks)
- c. What is digital Photogrammetry, discuss the significance of digital Photogrammetry (04 Marks)

OR

- 4 a. With a neat sketch discuss the geometry of vertical photograph. (08 Marks)
- b. Give a note on scale of photograph describe the mathematical expressions for determination of scales of vertical photograph add note on significance of relief displacement in aerial photograph. (06 Marks)
- c. Discuss various aspects of flight planning during aerial photograph. (06 Marks)

Module-3

- 5 a. What is GIS? Discuss the various components and functions of GIS. (08 Marks)
- b. What is database management system, discuss briefly various types of database. (08 Marks)
- c. What are the various data used in GIS? Discuss briefly about sources of the data. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. What is GPS? Discuss briefly various component / segments of GPS. (08 Marks)
- b. What is spatial analysis? What are the different types of spatial analysis. (06 Marks)
- c. What is Overlay Operation? How it is significant in the field of GIS discuss. (06 Marks)

Module-4

- 7 a. Discuss the applications of GIS and Remote sensing in mapping water perspective zones. (10 Marks)
- b. Discuss briefly the applications of GIS in Remote sensing in highway alignment and optimization of route. (10 Marks)

OR

- 8 a. What are the applications of Remote sensing and GIS in water quality studies and water pollution studies. (10 Marks)
- b. How remote sensing and GIS can be effectively used in the management of watershed / river basin. (06 Marks)
- c. How Rs GIS and GPS can be effectively used in accident analysis as a part of transportation engineering. (04 Marks)

Module-5

- 9 a. Describe application of remote sensing and GIS in Urban Planning and Management. (08 Marks)
- b. What is change detection study? How change detection can be effectively used in forest and urban changes. (08 Marks)
- c. What is urban sprawl how Rs and GIS can be effectively used in the study of urban sprawl. (04 Marks)

OR

- 10 a. What is Disaster? How disasters can be managed using Remote Sensing and GIS? Explain. (10 Marks)
- b. Discuss role on RS and GIS in design of layout for water distribution system add a note on different systems used? (10 Marks)

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21CV651

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025

Remote Sensing and GIS

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat sketch, explain the components of remote sensing. (10 Marks)
b. Explain the key elements of visual interpretation. (10 Marks)

OR

- 2 a. With a neat sketch explain the electromagnetic spectrum. (10 Marks)
b. Enumerate the types of sensors and platforms. (10 Marks)

Module-2

- 3 a. Explain photogrammetry with its types and advantages. (10 Marks)
b. Explain the process of aerial photogrammetry. (10 Marks)

OR

- 4 a. With a neat sketch explain the geometry and scale of vertical photograph. (10 Marks)
b. Enumerate the process of flight planning and its importance. (10 Marks)

Module-3

- 5 a. Define GIS and explain the components of GIS. (10 Marks)
b. Explain the types of database along with its advantages and disadvantages. (10 Marks)

OR

- 6 a. Explain the components of GPS and its working principles. (10 Marks)
b. Explain briefly the map projections and its types. (10 Marks)

Module-4

- 7 a. Explain the applications of remote sensing and GIS in highway alignment. (10 Marks)
b. Explain the applications of remote sensing and GIS in solving the environmental issues. (10 Marks)

OR

- 8 a. Explain the application of remote sensing and GIS in road accident analysis. (10 Marks)
b. Explain the application of remote sensing and GIS in water resource management. (10 Marks)

Module-5

- 9 a. Explain the application of remote sensing, GIS and GPS in urban planning. (10 Marks)
b. Explain the application of remote sensing and GIS in land use and land cover mapping. (10 Marks)

OR

- 10 a. Explain the application of GIS, remote sensing and GPS in Disaster Management. (10 Marks)
b. Explain the application of remote sensing and GIS in analysis and improving the crop yield. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025/ Design of Steel Structure

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS800 : 2007 and steel tables are permitted.
3. Missing data, if any, may be suitably assumed.*

Module-1

- 1 a. Explain the advantages and disadvantages of steel structures. (10 Marks)
b. Explain the failure criteria of steel. (05 Marks)
c. Explain the different types of structural section classification as per IS800 – 2007. (05 Marks)

OR

- 2 a. Explain the terms plastic hinge, shape factor, plastic moment, upper bound theorem and collapse mechanism. (10 Marks)
b. Determine the shape factor for a triangle of base 'b' and height 'h'. (10 Marks)

Module-2

- 3 a. Explain the advantages and disadvantages of HSBG bolts. (05 Marks)
b. Explain the behavior or failure of bolts in bolted connection with neat sketch. (05 Marks)
c. Design a bolted connection for a lap joint of plate thickness 10 mm and 12 mm to carry a factored load of 150 kN. Use M16 bolts of property class 4.6. Assume bolts with complete threads. (10 Marks)

OR

- 4 a. With neat sketch, explain the common defects in welding. (08 Marks)
b. Design the weld to transmit the load equal to the design strength of member ISA100 × 75 × 10 mm welded to a 12 mm thick gusset plate. Consider the welding in all 3 sides of a member and grade of section as Fe410. Consider the welding at site condition. (12 Marks)

Module-3

- 5 a. Explain the different modes of failure of compression members. (08 Marks)
b. Calculate the compressive strength of a compound column made up of ISMB 400 @ 604 N/m with two cover plates of size 300 mm × 20 mm. Length of column is 4.5 m. It is fixed at one end and hinged at the other. (12 Marks)

OR

- 6 Design a double angle discontinuous strut to carry a factored load of 175 kN. The length of the strut is 3 m between intersections. Consider the following cases:
i) Angles are placed on opposite sides of gusset plate.
ii) Angles are placed on the same side of gusset plate.
Take gusset plate of 10 mm thick. Assume grade Fe 410 steel with $f_y = 250$ MPa. (20 Marks)

Module-4

- 7 a. Explain different modes of failure of tension members with neat sketch. Write the formulae. (08 Marks)
- b. A single unequal angle $100 \times 75 \times 6$ mm is connected to a 8 mm thick gusset plate @ the ends by 4 mm weld as shown in figure. Determine the design tensile strength of the angle if the gusset is connected to 100 mm leg. Assume average length of weld as 225 mm. (12 Marks)

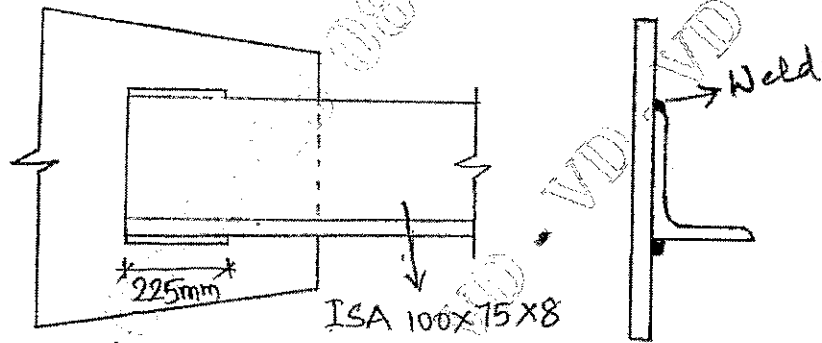


Fig.Q.7(b)

OR

- 8 a. What are lug angles? Explain with neat sketch. (05 Marks)
- b. Design a slab base for a column ISHB 300 @ 58.8 kg/m. It carries a factored axial load of 1500 kN. The grade of concrete is M20 and SBC of soil is 180 kN/m^2 . Design the slab base, concrete base and suitable connections. (15 Marks)

Module-5

- 9 a. With the help of neat sketch, explain the following: (08 Marks)
- Laterally restrained beam
 - Web buckling and web crippling.
- b. Calculate the design bending and design shear strength of a laterally restrained beam ISMB 600 @ 122.6 kg/m. Assume the beam is in low shear condition. (12 Marks)

OR

- 10 Design a laterally restrained simply supported rolled I-beam to support the slab of a hall $6 \text{ m} \times 21 \text{ m}$. Center to center spacing of beams is 3 m. Slab is of 100 mm thick. Consider a floor finish of 0.75 kN/m^2 and live load of 3 kN/m^2 . The slab is resting on a wall of thickness 300 mm all round. Perform all necessary checks for the design. (20 Marks)
