

# CBCS SCHEME

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15CV51

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021

## Design of RC Structural Elements

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS – 456 ,SP16 chart permitted.  
3. Assume missing data suitably.

### Module-1

- 1 a. What is Limit state? Explain different limit states to be considered in the design of RC beams. (06 Marks)  
b. Explain the terms Singly Reinforced and Doubly Reinforced, with neat sketch. (04 Marks)  
c. What is Stress block? Derive from fundamentals for the area of stress block  $0.36f_{ck} b x_u$  and depth of concrete of compressive force from the extreme fibre in compression  $0.42 x_u$ . (06 Marks)

OR

- 2 a. Briefly explain under reinforced , over reinforced and balanced with neat sketch. (08 Marks)  
b. A flanged beam of T – section is simply supported over an effective span of 8m. The beam has effective flange width of 1400mm , thickness of flange as 150mm , breadth of web as 300mm and effective depth of 450mm. It is reinforced with 4 bars of 25mm diameter in tension and 3 bars of 16mm diameter in compression. Check the beam for deflection. Use M20 and Fe 415 sheets. (08 Marks)

### Module-2

- 3 a. A RCC beam of section 330mm × 500mm is reinforced with 3 – bars of 20mm diameter with an effective cover 50mm. The beam is simply supported over a span of 5m. Find maximum permissible UDL on the beam. Use M20 grade concrete and Fe 500 steel. (08 Marks)  
b. Design a rectangular beam for an effective span of 6m. The superimposed load is 80kN/m and size of the beam is limited to 300mm × 700mm overall with an effective cover 50mm. Use M20 mix and Fe 415 grade steel. (08 Marks)

OR

- 4 a. A RC T – beam having total depth 380mm and width 230mm is cast monolithically with slab 110mm thick. The beam is simply supported over a span of 4.44m and spaced 3m c/c. Concrete mix M20 and steel of grade Fe 500 have been used. Calculate the maximum UDL. The beam can carry and the corresponding steel. (10 Marks)  
b. A RC beam 230mm wide and 450mm deep is reinforced with 3nos of #16mm bars of grade Fe415, on the tension side, with an effective cover of 50mm. Ultimate design shear force is 80kN. Design the shear reinforcement. (06 Marks)

### Module-3

- 5 A rectangular beam is to be simply supported on supports of 300mm width. The clear span of the beam is 6m. The beam is to have width of 230mm. The characteristic superimposed load is 12kN/m. Using M<sub>20</sub> and Fe500 steel, design the beam and sketch details of reinforcement. (16 Marks)

OR

- 6 Design a rectangular beam of section 300mm and 500mm over all. Effective span 6m and effective cover for reinforcement should be kept as 50mm. Superimposed load on the beam is 40kN/m. Use  $M_{20}$  concrete and Fe415 steel. Sketch details of reinforcement. (16 Marks)

**Module-4**

- 7 a. Distinguish between one way slab and two way slab. (04 Marks)  
 b. Design a continuous R.C. slab for a class room 7 m wide and 17.5m long. The roof is to be supported on RCC beams spaced at 3.5m intervals. The width should be kept 300mm. The super imposed load is  $3\text{kN/m}^2$  and finishing load is  $1\text{kN/m}^2$ . Use  $M_{20}$  concrete and Fe 500 steel. Show reinforcement details. (12 Marks)

OR

- 8 a. Design a R.C slab for a room measuring  $6.5\text{m} \times 5.0\text{m}$ . The slabs is to be cast monolithically over the beams with corners held down. The width of the supporting beam is 230mm. The slab carries superimposed load of  $5\text{kN/m}^2$ . Use  $M_{20}$  grade concrete and steel grade Fe500. Sketch details of reinforcement. (08 Marks)  
 b. Design a dog – legged stair for a building in which the vertical distance between floor is 3.6m. The stair hall measures  $2.5\text{m} \times 5.0\text{m}$ . the live load may be taken as  $2.5\text{kN/m}^2$ . Use  $M_{20}$  concrete and Fe 415 steel bars. (08 Marks)

**Module-5**

- 9 a. Explain the following : i) Pedestal ii) Short column iii) Long column. (03 Marks)  
 b. What are the assumptions made in the limit state of Collapse – compression? (04 Marks)  
 c. Design the reinforcement for a short axially load square column of size  $450\text{mm} \times 450\text{mm}$  to support a load of 1500kN and Fe500 steel. (09 Marks)

OR

- 10 A rectangular column  $400\text{mm} \times 600\text{mm}$  carries and live load of 2kN. The SBC of soil is  $150\text{kN/m}^2$ . Using  $M_{20}$  concrete and Fe415 steel. Design a rectangular footing to support the column. Sketch the details of reinforcement. (16 Marks)

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# CBCGS SCHEME

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15CV52

**Fifth Semester B.E. Degree Examination, Jan./Feb. 2021**

## Analysis of Indeterminate Structures

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 Analyze the frame shown in Fig.Q1. Using slope deflection method. Also draw BMD and sketch the elastic curve.

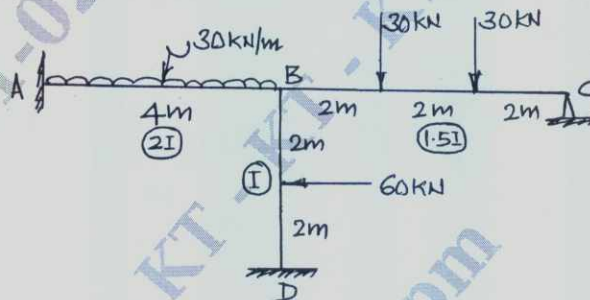


Fig.Q1

(16 Marks)

OR

- 2 Analyze the frame shown in Fig.Q2. Using slope deflection method. Also draw BMD and sketch the elastic curve.



Fig.Q2

(16 Marks)

### Module-2

- 3 Analyze the frame shown in Fig.Q3 by the method of Moment Distribution. Draw BMD, SFD and also sketch the elastic curve.

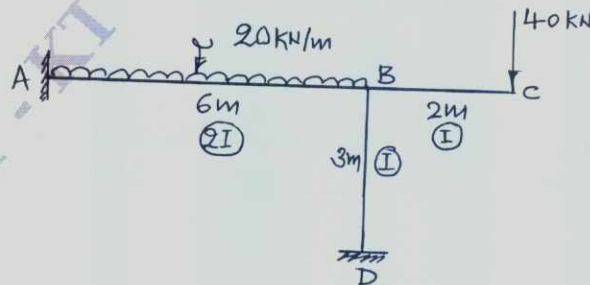


Fig.Q3

(16 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

- 4 Analyze the continuous beam shown in Fig.Q4 by the method of moment distribution. Draw BMD, SFD and also sketch the elastic curve.

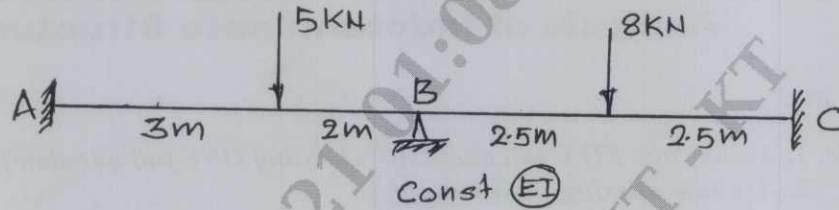


Fig.Q4

(16 Marks)

**Module-3**

- 5 Analyze the frame shown in Fig.Q5 by using Kani's method. Draw BMD and also sketch the elastic curve.

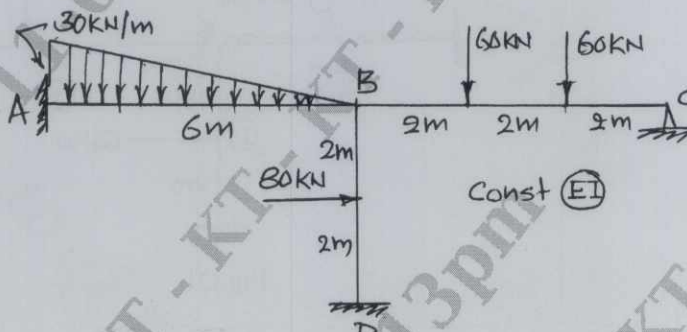


Fig.Q5

(16 Marks)

OR

- 6 Determine the support moments for the continuous beam shown in Fig.Q6 by Kani's method. The relative I values are indicated along the member in each span. E is constant. Draw BMD and elastic curve.

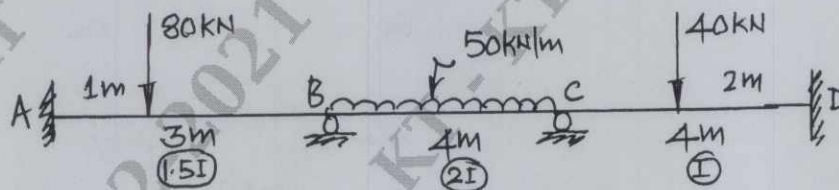


Fig.Q6

(16 Marks)

**Module-4**

- 7 Analyze the continuous beam shown in Fig.Q7 by flexibility matrix method. Take EI constant throughout. Draw BMD.

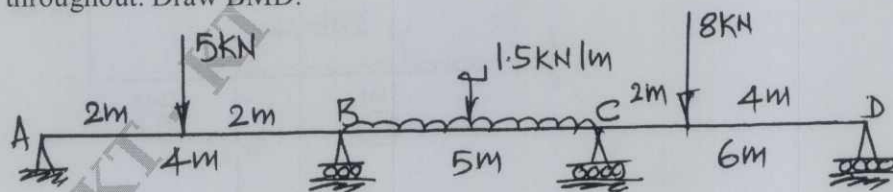
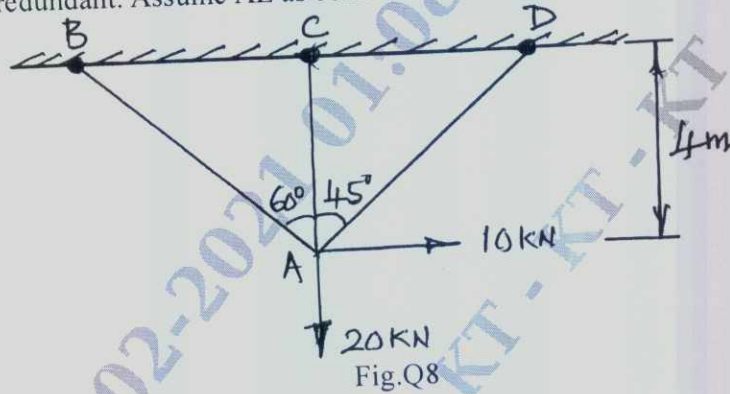


Fig.Q7

(16 Marks)

OR

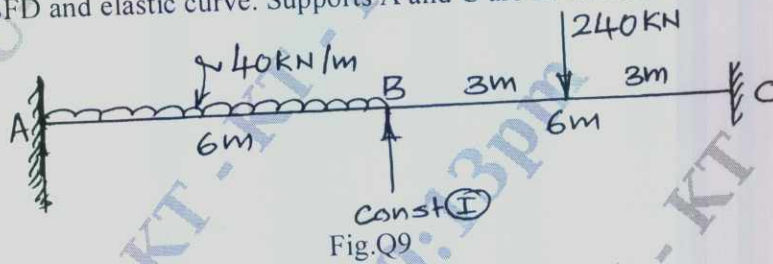
- 8 Analyze the truss shown in Fig.Q8 by flexibility matrix method. Choosing the force in member AD as redundant. Assume AE as constant for all members.



(16 Marks)

**Module-5**

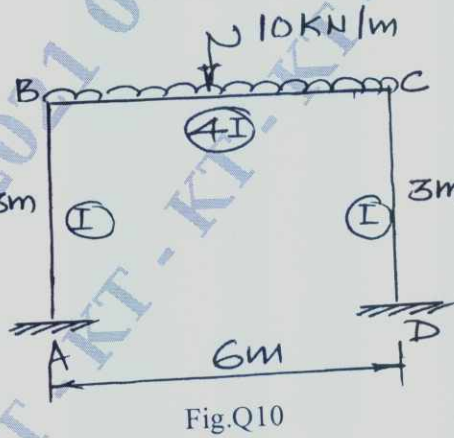
- 9 Analyze the continuous beam shown in Fig.Q9 by stiffness method, using system approach. Draw BMD, SFD and elastic curve. Supports A and C are fixed ends.



(16 Marks)

OR

- 10 Analyze the rigid jointed plane frame shown in Fig.Q10 by stiffness matrix method. Draw BMD.



(16 Marks)

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15CV53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021

## Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any, may be suitably assumed.

### Module-1

- 1 a. List the methods of soil exploration. With a neat sketch explain seismic refraction method. (08 Marks)
- b. A sampling tube has inner diameters of 70mm and cutting edge diameter of 68mm. Its outside diameter are 72mm and 74mm respectively. Determine the area ratio, inside clearance and outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 550mm with length of sample recorded being 530mm. Find recovery ratio. (08 Marks)

OR

- 2 a. List the methods of dewatering employed in field and with a neat sketch explain multi-stage well point system. (08 Marks)
- b. Estimate the position of the ground water table from the following data obtained from the field :
- i) Depth upto which water is bailed out = 30m
  - ii) Raise in water level on First day = 2.2m
  - iii) Raise in water level on Second day = 1.8m
  - iv) Raise in water level on Third day = 1.5m.
- (08 Marks)

### Module-2

- 3 a. Compare Bousinesq's and Westergaard's analysis. Also state their limitations. (08 Marks)
- b. Find the intensity of vertical pressure and horizontal shear stress at a point 4m directly below a 20kN point load acting at a horizontal ground surface. What will be the vertical pressure and shear stress at a point 2m horizontally away from the axis of loading but at the same depth of 4m? (08 Marks)

OR

- 4 a. Explain the terms immediate settlement, consolidation settlement, secondary settlement differential settlement and uniform settlement. (10 Marks)
- b. Estimate the immediate settlement of a footing of size 2m × 3m resting at a depth of 2m in a sandy soil whose compression modulus is 10N/mm<sup>2</sup> and the footing is expected to transmit a unit pressure of 160 kN/m<sup>2</sup>. Assume  $\mu = 0.28$  and  $I_f = 1.06$ . (06 Marks)

### Module-3

- 5 a. With neat sketches explain types of earth pressure. (08 Marks)
- b. A retaining wall of 8m height retains sandy material. The properties of sand are  $e = 0.6$ ,  $\phi = 30^\circ$  and  $G = 2.65$ . The water table is at a depth of 2.5m from the ground surface. Draw the earth pressure diagram and determine the intensity of earth pressure at the base of the retaining wall. (08 Marks)

OR

- 6 a. List causes of slope failure and with neat sketches explain types of slope failures. (08 Marks)  
 b. A 5m deep canal has side slopes of 1 : 1. The properties of soil are  $C_u = 20\text{kN/m}^2$ ,  $Q_u = 10^\circ$ ,  $e = 0.8$ , and  $G = 2.8$ . If Taylor's stability number is 0.108 determine the factor of safety with respect to cohesion when the canal runs full. Also find the same in case of draw down, if the stability numbers for this condition is 0.137. (08 Marks)

**Module-4**

- 7 a. With a neat sketch explain standard penetration test. (08 Marks)  
 b. Determine the safe bearing capacity of square footing 2.1 width placed at a depth of 1.5m in a soil with saturated unit weight of  $17\text{ kN/m}^3$ ,  $C = 15\text{ kN/m}^2$ ,  $\phi = 20^\circ$ ,  $N_c = 11.8$ ,  $N_q = 3.9$  and  $N_r = 1.7$ . What is the change in bearing capacity, if the water table raises to 0.5m above the base of the footing? Assume factor of safety as 3. (Take unit weight of soil as  $17\text{kN/m}^3$  for all cases). (08 Marks)

OR

- 8 a. With neat sketches explain types of shallow foundations. (10 Marks)  
 b. A square footing located at a depth of 1.3m below ground has to carry a safe load of 800kN. Find the size of footing if the desired factor of safety is 3. Use Terzaghi's analysis for general shear failure. Take  $C = 8\text{ KPa}$ ,  $N_c = 37.2$ ,  $N_q = 22.5$  and  $N_r = 19.7$ . (06 Marks)

**Module-5**

- 9 a. Explain the classification of piles based on load transfer and function. (08 Marks)  
 b. In a 16 pile group, the pile diameter is 45cm and centre to centre spacing of the piles is 1.5m. If  $C = 50\text{ kN/m}^2$ , determine whether the failure would occur with the pile acting individually or as a group? Neglect bearing at the tip of the pile. All piles are 10m long. Take  $M = 0.7$ . (08 Marks)

OR

- 10 a. With a neat sketch explain negative skin friction. (08 Marks)  
 b. A pile group of 9 piles, 10m long is used as a foundation for a bridge pier. The piles used are 30cm diameter with centre to centre spacing of 0.9m. The sub soil consists of clay with unconfined compressive strength of  $1.5\text{kg/cm}^2$ . Determine the efficiency neglecting bearing action. Take adhesion factor as 0.9. (08 Marks)

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15CV551

## Fifth Semester B.E. Degree Examination, Jan./Feb. 2021 Air Pollution and Control

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Write the definition of Air Pollution as per the recommendations of I.S. (02 Marks)
- b. Explain the effects of carbon monoxide and lead on human health. (06 Marks)
- c. Explain the basic theory of formation of Photochemical Smog, with the necessary reactions. (08 Marks)

OR

- 2 a. Discuss primary and secondary air pollutants with examples. (04 Marks)
- b. Briefly explain the effects of air pollutants on plants and materials. (04 Marks)
- c. What is inversion? Explain different types of inversion. (08 Marks)

### Module-2

- 3 a. Explain the Environmental Lapse Rate (ELR) and Adiabatic Lapse Rate (ALR) and their utility in understanding the different atmospheric stability conditions. (08 Marks)
- b. Explain with neat sketches, how plumes behaviour in different atmospheric stability conditions. (08 Marks)

OR

- 4 a. Write a note on Mixing depths. (04 Marks)
- b. With a neat sketch explain the importance of Windrose in the air pollution studies. (06 Marks)
- c. A boiler with a stack of 220m height of 0.42m diameter is releasing flue gas at a velocity 15.0 m/s at 170°C. Wind speed at the stack height is 6 m/s and ambient temperature is 30°C. Estimate the plume rise when the environment lapse rate is  $-2.5^{\circ}\text{C}/100\text{m}$  and  $+2.0^{\circ}\text{C}/100\text{m}$ . (06 Marks)

### Module-3

- 5 a. Write a brief procedure for pollution of suspended particulate matter using H.V.A.S. (08 Marks)
- b. Explain adsorption and absorption techniques in controlling gaseous pollutants. (08 Marks)

OR

- 6 a. Explain with a neat sketch, a typical sampling train for sampling particulate matter. (08 Marks)
- b. Give in detail method for measuring concentration of  $\text{SO}_2$  and  $\text{NO}_x$  in H.V.A.S. (08 Marks)

### Module-4

- 7 a. Explain the control of air pollutants by the use of cyclone separator control device with a neat sketch. (08 Marks)
- b. With a neat sketch, explain the principle, construction and working of fabric filter. (08 Marks)



OR

- 8 a. With a neat sketch, explain the principle and operation of an Electrostatic Precipitator. (08 Marks)
- b. List the different types of Wet Scrubbers and explain any one of them with a neat sketch. (08 Marks)

**Module-5**

- 9 a. Define Noise Pollution. List the sources of noise pollution. (04 Marks)
- b. Write short notes on Ozone Layer Detection. (04 Marks)
- c. Discuss the following cases of air pollution episodes: (08 Marks)
- (i) London Killer's Smog
- (ii) Bhopal Gas Tragedy

OR

- 10 a. Explain briefly the principal emission from gasoline and diesel driven vehicles. (06 Marks)
- b. Explain with a help of neat sketch the green house effect. (05 Marks)
- c. List the Indian Ambient Air Quality standards. (05 Marks)

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15CV561

## Fifth Semester B.E. Degree Examination, Jan./Feb. 2021 Traffic Engineering

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Describe the different static characteristics of vehicles that effect road design and traffic performance. (08 Marks)  
b. Enumerate the urban traffic problems in India. (04 Marks)  
c. Explain modal integration. (04 Marks)

OR

- 2 a. A passenger car weighing 10kN is required to accelerate at a rate of  $2 \text{ m/sec}^2$  in the first gear from a speed of 10kmph to 20kmph. The gradient is +2 percent and the road has a WBM surface in good condition. Frontal projection of the area of car is  $2.15 \text{ m}^2$ . Car tyres have radius of 0.33m. The rear axle gear ratio is 3.82:1 and the first gear ratio is 2.78:1. Calculate the engine horse power needed and the speed of the engine. Make suitable assumptions. Coefficient of air resistance = 0.39, coefficient of rolling resistance = 0.025, tyre deformation factor = 0.945, transmission efficiency = 0.90. (08 Marks)  
b. Explain briefly sustainable approach of land use and transport related to traffic planning. (08 Marks)

### Module-2

- 3 a. What is 30<sup>th</sup> highest hourly volume? Explain its importance with a neat sketch. (08 Marks)  
b. The table below gives the consolidated data of spot speed studies on a section of a road. Determine the most preferred speed at which maximum proportion of vehicles travels.

| Speed range<br>kmph | No. of speed<br>observations | Speed range<br>kmph | No. of speed<br>observations |
|---------------------|------------------------------|---------------------|------------------------------|
| 0-10                | 0                            | 50-60               | 216                          |
| 10-20               | 11                           | 60-70               | 68                           |
| 20-30               | 30                           | 70-80               | 24                           |
| 30-40               | 105                          | 80-90               | 0                            |
| 40-50               | 233                          |                     |                              |

(08 Marks)

OR

- 4 a. A vehicle of weigh 2.0 tonne. Skids through a distance equal to 40m before colliding with another parked vehicle of weight 1.0 tonne. After collision both the vehicle skids through a distance equal to 12m before stopping. Compute the initial speed of the moving vehicle. Assume average coefficient of friction as 0.50. (06 Marks)  
b. Explain various forms of presenting O and D data. (06 Marks)  
c. List the objectives of carrying out parking studies. (04 Marks)

1 of 2

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.

**Module-3**

- 5 a. Briefly explain the design factors of rotary intersection with neat sketch. (08 Marks)  
b. Mention the various measures adopted to increase the safety of pedestrians. (08 Marks)

OR

- 6 a. Write a short note on the following:  
i) Signal coordination (08 Marks)  
ii) Road markings. (08 Marks)  
b. What is channelization? Briefly explain the purpose of channelization. (08 Marks)

**Module-4**

- 7 a. Briefly explain the effect of traffic noise on the environment. (08 Marks)  
b. Explain the various characteristics considered in judging the efficiency of a transport mode. (08 Marks)

OR

- 8 a. Explain the different measures adopted to control air pollution created by road traffic. (08 Marks)  
b. Explain how to promote non-motorized transport in a country, indicating its advantages. (08 Marks)

**Module-5**

- 9 a. Define intelligent transport system. Brief out its application in traffic engineering field. (08 Marks)  
b. What do you mean by "area traffic control"? Mention its objectives, indicating the types of methods adopted in traffic control. (08 Marks)

OR

- 10 Define transportation system management. Mention the various well-known traffic management measures. Explain any two traffic management measures in detail. (16 Marks)

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