7E1712

7E1712

B. Tech. VII - Sem. (Main) Exam., January - 2022
Civil Engineering
7CE4 – 01 Transportation Engineering

Time: 3 Hours

Maximum Marks: 120
Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 Explain the objectives of Transportation Engineering.

Q.2 State the different cross-sectional elements of highways.

Q.3 Explain the difference between flexible pavement and rigid pavement.

Q.4 Explain roller compacted road construction.

Q.5 Describe the role of filler in Bituminous mix.

Q.6 Explain the salient features in selection of gauges in Indian Railway.

Q.7 State the advantage of Transition curve.

Q.8 Discuss requirement of Airport planning.

Q.9 Write short notes on Fly ash.

Q.10 State modern trends in water transportation.

PART – B

(Analytical/Problem solving questions) [5×8=40]

Attempt any five questions

Q.1 Explain briefly classification of Roads.

Q.2 Discuss engineering surveys for alignment.

Q.3 Describe the construction of WBM roads with a neat sketch.

Q.4 Discuss various rail fastenings with a neat sketch.

Q.5 Explain the various Highway agencies.

Q.6 Define Harbour. Explain briefly classification of harbours.

Q.7 Explain various factors in Airport site selection.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]

Attempt any four questions

Q.1 Explain the design of flexible pavement as per IRC.

Q.2 Write short note on PMGSY project.

Q.3 A vertical summit curve is formed at the inter-section of two gradients, +3.0% and 5.0%. Design the length of summit curve to provide stopping sight distance for a design speed of 80 kmph. Assume data as per IRC.

Q.4 Explain the different types of road roller for flexible and rigid pavements.

Q.5 Derive an expression for overtaking sight distance.

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7E1713

7E1713

B. Tech. VII - Sem. (Main / Back) Exam., January - 2022
Open Elective-I
7CE6 – 60.1 Environmental Impact Analysis

Time: 3 Hours

Maximum Marks: 120
Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   **[10×2=20]**

All questions are compulsory

Q.1 Define EIA and list out the need for EIA.   [2]

Q.2 Write about the effect of human activity on environment.   [2]

Q.3 Define Environmental Impact Statement (EIS).   [2]

Q.4 What do you understand by Environment Management Plan (EMP)?   [2]

Q.5 Describe the impact of any two water pollutants.   [2]

Q.6 What are the measure sources of noise pollution?   [2]

Q.7 What are the standards for air quality?   [2]

Q.8 What is prediction and assessment of impacts? [2]

Q.9 What do you understand by Energy Impacts? [2]

Q.10 What is public participation in environmental decision making? [2]

PART – B

(Analytical/Problem solving questions) [5×8=40]

Attempt any five questions

Q.1 What are the guidelines of MoEF and CPCB as per Indian Scenario for EIA? [8]

Q.2 Write about industrial policy of the Government of India for EIA. [8]

Q.3 What do you understand by land pollution due to construction activities? [8]

Q.4 Write about the air quality impact of industry transport system. [8]

Q.5 Discuss the role of an Environmental Engineer in context with EIA. [8]

Q.6 What is noise scales and rating method propose control measures for noise pollution? [8]

Q.7 Write short notes on followings – [8]

    (a) Copenhagen conference

    (b) Rio – Earth Summit

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]

Attempt any four questions

Q.1 Discuss in detail the methodologies for Environmental Impact Assessment. [15]

Q.2 Explain effect of developmental project on cultural and social settings and economic profile of the community. [15]

Q.3 Define Biota. How human activity can create impact on fauna and flora? Write about mitigation measures and alternatives for this. [15]

Q.4 Explain prediction and assessment of impacts on air, water, noise, land and socio – economic environment. [15]

Q.5 Explain any case study of EIA in detail. [15]

Roll No. _____

Total No. of Pages: 2

7E1714

7E1714

B. Tech. VII - Sem. (Main / Back) Exam., January - 2022
Open Elective - I
7CE6 – 60.2 Disaster Management

Time: 3 Hours

Maximum Marks: 120
Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 Define meteorological disaster.

Q.2 What is a nuclear hazard?

Q.3 What is disaster management cycle?

Q.4 Define the term 'Rehabilitation'.

Q.5 What is the role of NDRF?

Q.6 What is vulnerability?

Q.7 What is response time?

Q.8 What are the different cause of landslides?

Q.9 Define Earthquake.

Q.10 Define Global Warming.

PART – B

(Analytical/Problem solving questions) [5×8=40]
Attempt any five questions

Q.1 What are the different types of Natural Disasters?

Q.2 Describe the major analytical system for risk assessment.

Q.3 Explain the role of civilian in disaster management.

Q.4 What are vulnerabilities to flood and earthquake hazards?

Q.5 What are the various sources of funding relief during disaster?

Q.6 Explain disaster management cycle.

Q.7 Explain Disaster Management Act and Policy in India.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]
Attempt any four questions

Q.1 What do you understand by avalanche hazard mitigation and management?

Q.2 Define vulnerability analysis and describe various approaches to vulnerability analysis.

Q.3 Discuss the concept and significance of disaster preparedness.

Q.4 Discuss the significance of disaster recovery planning in coping with disaster.

Q.5 Describe the role of media in disaster management.

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Roll No. _____

7E1710

7E1710

7E1710

B. Tech. VII - Sem. (Main / Back) Exam., March - 2022
Open Elective - I
7AG6 – 60.1 Human Engineering and Safety

Time: 3 Hours

Maximum Marks: 120
Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 What is the importance of anthrometric data?

Q.2 Why is it important to integrate human factors principles into system engineering?

Q.3 What is the first step in the system development process?

Q.4 Under what conditions are auditory displays best used?

Q.5 What are the different elements of human system that are considered in ergonomics?

Q.6 What are the factors considered in operator workplace design?

Q.7 What safety measures should be adopted in case of dangerous machines?

Q.8 What are the two types of anthropometry?

Q.9 How do human factors affect human performance?

Q.10 Define Dangerous Machine (Regulation) Act.

PART – B

(Analytical/Problem solving questions) [5×8=40]

Attempt any five questions

Q.1 Define ergonomics. What are the system goals of ergonomics? Explain.

Q.2 Explain the Dangerous Machines (Regulation) Rules, 2007.

Q.3 What are the human factors requirements to be included in the system specification of a design? Explain.

Q.4 What is the difference between human factors and physical factors?

Q.5 What are the main steps of system development and explain each step?

Q.6 What are the Dangerous Regulation Machine Act for rehabilitations and compensation to accident victims? Explain.

Q.7 What factors determine the appropriate amount of space to allocate to each individual within the organization?

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]

Attempt any four questions

Q.1 What are the principles of anthropometry? Explain the purpose of anthropometric. Also write the limitations of anthropometric measurements.

Q.2 (a) What is ergonomics? Explain which human factors are consider in product design?
   (b) What are the human factors that affect user interface?

Q.3 Explain measurement of energy. Also explain direct and indirect method in detail.

Q.4 Explain –
   (a) Noise and vibration
   (b) Threshing
   (c) Safety gadgets for spraying

Q.5 Explain arrangement and utilization of work space in detail.

Roll No. _____

7E1711

7E1711

B. Tech. VII - Sem. (Main / Back) Exam., January - 2022
Open Elective - I
7AG6 – 60.2 Environmental Engineering and Disaster
Management

Time: 3 Hours

Maximum Marks: 120
Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. <u>NIL</u>   2. <u>NIL</u>

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 Discuss objectives and scope of Environmental Engineering and Disaster Management.

Q.2 What are the elements of Disaster management?

Q.3 Discuss the different sources of Water Supply System.

Q.4 Categorize the demand of water supply for various purpose.

Q.5 Write a short note on impurities present in water.

Q.6 Give difference between sewage and sewerage.

Q.7 Give difference between dry weather flow and storm water.

Q.8 Write the name of different types of sewer used based on material.

Q.9 Give difference between natural disasters and man-made disasters.

Q.10 How are the advanced technologies useful in disaster management?

PART – B

(Analytical/Problem solving questions)   [5×8=40]

Attempt any five questions

Q.1 Discuss the factors affecting water requirements for both urban and rural areas.

Q.2. Give the name of different types of intake. What do you understand by design of intake, write about site selection for location of intake.

Q.3 Write about the physical test for analysis of water.

Q.4 Discuss disposal method of domestic wastewater in urban and rural areas.

Q.5 Write about the process commonly employed in domestic wastewater treatment.

Q.6 Discuss BIS standards for pollutants in air.

Q.7 What are the effects of air pollution on living beings?

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)   [4×15=60]

Attempt any four questions

Q.1 (a) Discuss and give outline of the water supply system with the help of flow diagram.

 (b) Explain underground sources of water Infiltration galleries and Infiltration wells with the help of neat diagram.

Q.2 Discuss treatment process that are generally adopted for surface water. Also give layout of a conventional water treatment plant.

Q.3 Discuss quantity and characteristics of domestic wastewater.

Q.4 Explain solid waste management system with the help of flow diagram.

Q.5 Write the importance of Disaster Management, discuss cause and effect of various types of disasters which are generally occur in India.

7E7062

7E7062

B. Tech. VII - Sem. (Main / Back) Exam., March - 2022
Civil Engineering
7CE2A Design of Steel Structures - I

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

*Instructions to Candidates:*
  Attempt any five questions, selecting one question from each unit.
  All questions carry equal marks. Schematic diagrams must be shown wherever
  necessary. Any data you feel missing suitably be assumed and stated clearly.
  Units of quantities used/calculated must be stated clearly.
  Use of following supporting material is permitted during examination.
  (Mentioned in form No. 205)

1. NIL _____   2.   NIL _____

UNIT- I

[4]

Q.1 (a) Find slope factor for a circular section.   [12]

  (b) Complete the collapse load for the portal frame as shown in fig.
      Given fy = 250 N/mm² and the value of Zp for columns AB and DE equal to
      1100×10^3 mm³ and that for the member BD as 2200×10^3 mm³.
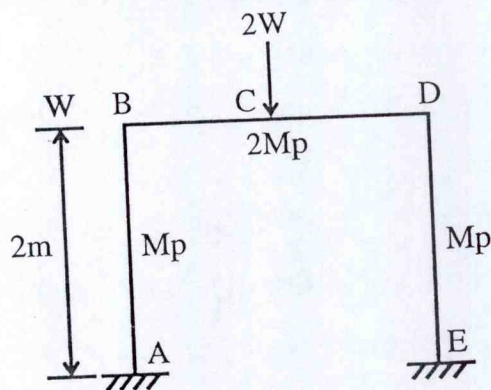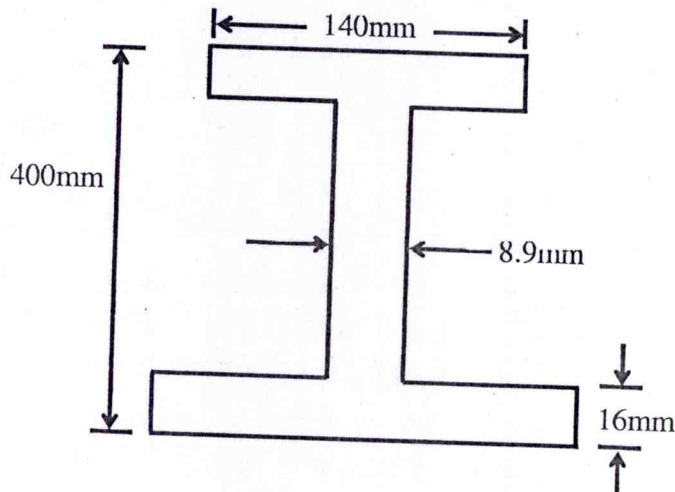
<div align="center">383</div>

<div align="center">**OR**</div>

Q.1 (a) State statical and kinematical theorems for plastic analysis. [4]

(b) Determine the plastic and elastic section modulus and the shape factor of the I section shown in fig. [12]
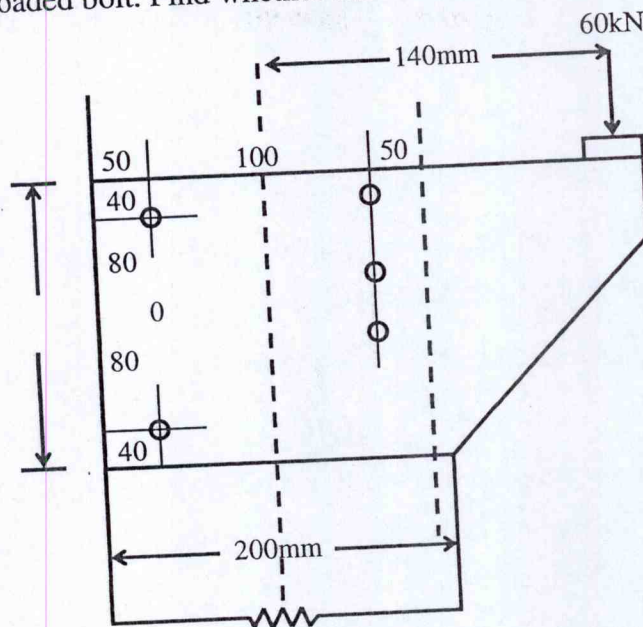

<div align="center">## UNIT- II</div>

Q.2 (a) Two plates 10 mm and 18 mm thick are to be joined by a double cover butt joint. Assuming cover plates are of 8 mm thickness, design the joint to transmit a factored load of 500 kN. Assume fe 410 plate and grad 4.6 bolt. [8]

(b) Design an I – section truss member for the following data length of the member L = 3.2 m factored axial tension = 400 kN factored moment at the two ends of the member about strong axis M_2 = 30 kN – m and 20 kN – m respectively steel grade fe = 410. [8]

<div align="center">**OR**</div>

Q.2 (a) A tie member of a truss consisting of an angle section ISA 90 × 90 × 8 of fe 410 grade is welded to an 12 mm gusset plate. Design a weld to transmit a load equal to the full strength of the member assume shop welding. [8]

(b) A plate bracket connection is as shown in fig the factored load 60 kN is applied at an eccentricity of 140 mm. There are 6 bolts of grade 4.6 of diameter 18 mm considering the heavily loaded bolt. Find whether the connection is safe. [8]

UNIT- III

Q.3 Design a built up column 9 m long to carry a factored axial compressive load of 1100 kN. The column is restrained in position but not in direction at both the ends. Design the column with connecting system as battens with bolted connection. Use two channel sections back to back. Use steel of grade fe 410. [16]

OR

Q.3 (a) What are buckling classes and how do they affect compression carrying capacity of the column section. [4]

(b) An ISHB 250 @ 510 kg/m is strengthened by welding a plate 300 mm × 10 mm to each flange symmetrically. Find the design factored maximum axial compressive load which the section can take safely if it is 3.0 m long. Its both ends are restrained against position but not against direction. [12]

UNIT- IV

Q.4 (a) Determine the design bending strength of ISLB 350 @ 486 N/m. Considering the beam to be :

[12]

(i) Laterally supported

(ii) Laterally unsupported

The design shear force V is less than the design shear strength. The unsupported length of the beam is 3.0 m. Assume steel of grade fe 410.

(b) What do you understand by the term web buckling and web crippling.   [4]

OR

Q.4 (a) Design a laterally supported beam having effective span 6.0 m. The beam is simply supported at the two ends and carries a uniform by distributed factored load of 30 kN/m including its self weight.

[10]

(b) What do you understand by term lateral torsional buckling with reference to a beam design?

[6]

UNIT- V

Q.5 (a) Differentiate between slab base and gusseted base as column base.   [6]

(b) Design a slab base for a column consisting of a single ISHB 300 @ 0.577 kN/m and carrying an axial load of 1600 kN (factored). The column is to be supported on a concrete footing with permissible bearing pressure 4 N/mm².

[10]

OR

Q.5 (a) What are column bases? Discuss their functions.

[6]

(b) A column in a steel building is 4.5 m in height : A beam transfer its reaction of 400 kN at an eccentricity of 80 mm from the major axis of the section. Check whether the section ISHB 800 @ 58 kg/m is satisfactory.

[10]

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7E7063

B. Tech. VII - Sem. (Main / Back) Exam., March - 2022
Civil Engineering
**7CE3A Design of Concrete Structures - II**

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from each unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. IS 456:2000

2. IS 3370 (Part II & IV)

3. IRC 21

4. IRC6 (2000)

5. IS 1343 (1980)

6. IS:875

UNIT- I

Q.1 (a) What is the difference between pre tensioning and post tensioning? Describe any six advantages of pre-stressed concrete members over reinforced concrete members.

[2+6=8]

(b) Calculate the extreme fiber stresses at the mid span of the beam of Fig.1. The beam is having parabolic profile with a pre stressing force of 1000 kN. It is carrying a uniformly distributed load of 40 kN/m including its self-weight over a span of 5.0 m. The cross-section of rectangular beam is 300 mm × 600 mm.

[8]
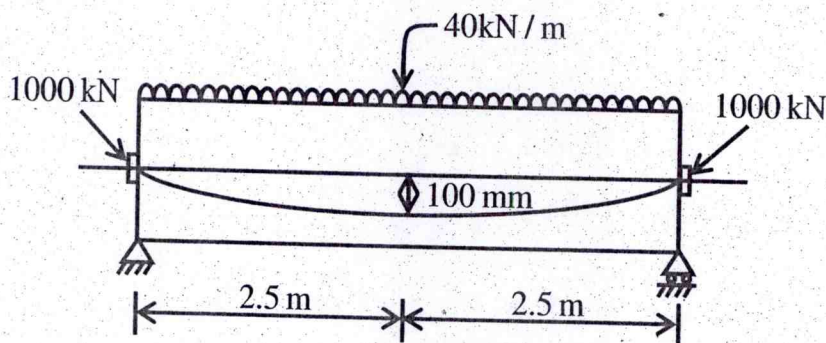
OR

Q.1 A post tensioned prestress concrete beam of 28 m simply supported span is subjected to a prestress of 3700 kN at transfer. Profile of the cable is parabolic with maximum eccentricity of 185 mm at the center. Determine the loss of prestress and the jacking force required if jacking is done from both end of the beam. The beam is 400 mm wide and 750 mm deep and is prestressed with 9 cables each consisting of 12 wires of 6 mm diameter. Assume E_s and E_c as 2×10^5 N/mm^2 and 3×10^4 N/mm^2 respectively. Each cable is tensioned at a time.

[16]

UNIT - II

Q.2 (a) Find the reinforcement of a ring beam of rectangular section 450 mm wide and 800 mm deep with an effective cover of 50 mm. It is subjected to bending moment of 70 kN-m, torsional moment of 60 kN-m and shear force of 65 kN at working load. Assume grade of concrete M-25 and steel Fe-415. [10]

(b) Explain the concept of redistribution of moment. Also, describe any two advantages of redistribution of moment in the design of statically indeterminate structures. [4+2=6]

OR

Q.2 Design a continuous reinforced concrete beam of rectangular section to support a dead load of 10 kN/m and live load of 13 kN/m over three spans of 6.2 m each. The ends are simply supported. Take M-20 grade concrete and Fe 415 grade steel. Sketch the details of reinforcement in the beam. [16]

UNIT - III

Q.3 A spherical dome, span 10 m and rise 2 m, has a shell which is 120 mm thick. It carries a lantern load of 5000 N at its apex. The wind load on the dome is estimated to be equivalent to 1200 N/m². Examine the stresses in dome and design suitable reinforcement. [16]

OR

Q.3 Design a rectangular water tank resting on ground having base area of 4m × 6m. The height of water tank is 3.75 m and keep a free board of 0.15 m. Assume M-25 grade of concrete and Fe-415 steel. Assume appropriate data and clearly state the assumptions. [16]

UNIT - IV

Q.4 (a) What are the assumptions in yield line theory? [4]

(b) A slab whose length is twice its breadth is simply supported on three sides. It is free on one of its longer sides. If the moment capacities are equal in both directions, calculate the collapse load. [12]

OR

Q.4 Design a cantilever retaining wall to retain an earth embankment 4.5 m high above ground level, the density of earth is 18 kN/m³ and its angle of repose is 30°. The embankment is horizontal at top. The safe bearing capacity of soil may be taken as 200 kN/m² and the coefficient of friction between soil and concrete is 0.5. Take M 25 concrete and Fe 415 steel. [16]

UNIT - V

Q.5 Design a slab for culvert for a clear span of 6 m having a clear road way of 7.5 m for a single vehicle of IRC class AA track vehicle loading only. Wearing coat 80 mm, Footpath of either side 1 m. Width of bearing is 0.4 m. Use M 25 and Fe 415. [16]

OR

Q.5 Write short notes on the following: [16]

(a) Importance of hydraulic factors in bridge design

(b) Impact effect while considering the vehicle load

(c) Design loads for "Kerb"

(d) Disposition of tracked vehicle (Class AA) for maximum bending moment

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7E7064

7E7064

B. Tech. VII - Sem. (Back) Exam., March - 2022

Civil Engineering

7CE4A Transportation Engineering - II

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____

2. NIL _____

UNIT- I

Q.1 (a) What do you understand by coning of wheels? Explain.   [6]

(b) Draw the typical cross-sections of a railway track under the following conditions-   [10]

(i) A B.G. straight track in cutting for a double line.

(ii) A B.G. track on curve for a single line.

(iii) A double line B.G. track for use of electric traction.

(iv) A double line B.G. track on curve in cutting

Q.1 (a) What do you understand by fastenings for railway track? Describe the various types of fastening and their functions. [8]

(b) What is the function of 'yard'? What is the classification of yard? Explain in detail the construction and function of marshaling yard. [8]

UNIT- II

Q.2 (a) Discuss the objectives of urban transport. Explain the major issues relating to the development of the metropolitan transport system. [8]

(b) What do you understand by points of switches? [8]

OR

Q.2 (a) Calculate all the elements required to set out a 1 in 12 turnout taking of from a straight B.G. track with its curve starting from the toe of the switch and passage through Theoretical Nose Crossing (T.N.C.) Take heel divergence $d = 11.4$ cm. Use right angle method. [8]

(b) What do you understand by a crossing? Explain different types of crossing used in railway track. [8]

UNIT- III

Q.3 (a) How do you define the superelevation? What are the objects of providing superelevation on curves of a railway track? [8]

(b) What are the objectives of providing transition curves on railways? What should be the requirements of an ideal transition curve? [8]

OR

Q.3 (a) What do you understand by cant deficiency? [8]

(b) Explain various types of curves. [8]

UNIT- IV

Q.4 (a) Enumerate the various factors which will help in selecting a suitable sites for an

[8]

airport.

[8]

(b) Explain different patterns of runway configurations.

OR

Q.4 An airport is proposed at an elevation of 400m above mean sea level where the mean of

average daily temperatures of the hottest month are 44.8 °C and 26.2 °C respectively. The

maximum elevation difference along the proposed profile of runway is 6.3m. If the basic

length of runway is 1260m. Determine the actual length of runway to be   provided.

[16]

UNIT- V

Q.5 (a) What are the objectives of designing of the aircraft pavements? Explain different types

[8]

of pavements.

[8]

(b) Explain the methods for design of rigid pavements.

OR

[8]

Q.5 (a) Describe the CBR method of designing the flexible pavements.

[8]

(b) Explain in brief about causes of failures of pavements.

7E7065

7E7065
B. Tech. VII - Sem. (Main / Back) Exam., March - 2022
Civil Engineering
7CE5A Application of Numerical Methods in Civil Engg.

Time: 3 Hours   Maximum Marks: **80**
Min. Passing Marks: **24**

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL   2. NIL

UNIT- I

Q.1 Explain the Taylor's Theorem and derive general formula for errors using the Taylor's theorem.   [16]

OR

Q.1 (a) Convert $(0.859375)_{10}$ to the corresponding binary fraction.   [8]

(b) What is meant by absolute and relative errors? If –

$$y = \frac{0.31x + 2.73}{x + 0.35}$$

Where the coefficients are rounded-off? Find the absolute and relative errors in y.

When $x = 0.5 \pm 0.1$ [8]

UNIT- II

Q.2 (a) Find a real root of the equation

$$x^3 - 2x - 5 = 0$$

by Bisection method correct upto two decimal places. [8]

(b) Find root equation $x^2 + 4\sin x = 0$ by Regular Falsi method. [8]

OR

Q.2 Using Newton-Raphson method, find a root of the equation.

$$f(x) = x\sin x + \cos x = 0$$

Correct to three decimal places, assuming that the root is near to $x = \pi$. [16]

UNIT- III

[16]

Q.3 Solve the system of equations -

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \\ -10 \end{bmatrix}$$

OR

Q.3 (a) Reduce the matrix $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 7 & 13 \\ 4 & -3 & -1 \end{bmatrix}$ to the normal form and hence. Find its rank.[8]

(b) Use Gauss Elimination to solve. [8]

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

UNIT- IV

Q.4 Using Gauss Seidel Iterative method, solve the following system of equations -   [16]

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110$$

OR

Q.4 (a) Write applications of system of equations in civil engineering.   [8]

(b) Starting with $x^{(0)} = [0.5, -0.5, -0.5]^T$ and using Jacobi method. Find the next three iterations for the system.   [8]

$$4x + y + z = 2$$

$$x + 5y + 2z = -6$$

$$x + 2y + 3z = -4$$

UNIT- V

Q.5 (a) Using Newton's divided difference formula find f(x) as a polynomial in x, from the following table -   [8]

x	f(x)
-1	3
0	-6
3	39
6	822
7	1611

(b) Given the data points (0, 1), (1, 3), (2, 7) and (3, 13) satisfying the function y = f(x), compute f(0.5) using Newton's Forward Interpolation formula.   [8]

OR

Q.5 Given the following value of f(x) and f'(x) -

x	-1	0	1
f(x)	1	1	3
f'(x)	-5	1	7

Estimate the value of f(-0.5) and f(0.5) using Hermite Interpolation. [16]