

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CIVIL/CE(MC)501/2022-23
2022
CONSTITUTION OF INDIA

Full Marks: 70

Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions

- | | | |
|----|---|--------|
| 1. | Define the terms "Government" & "Constitution". | 5x2=10 |
| 2. | What do you mean by "Indian Federalism". | 2 |
| 3. | What are the directive principles of State policy | 2 |
| 4. | Define INDIAN CITIZENSHIP | 2 |
| 5. | What is Public Interest Litigation (PIL) | 2 |

GROUP-B
[LONG TYPE QUESTIONS]

Answer any **four** from the following

15x4=60

- | | | |
|-----|---|-----|
| 6. | a) Briefly explain Partition and Indian Independence | 2+3 |
| | b) Briefly discuss the main Provisions of Indian Independence Act, 1947 | 5 |
| | c) Write down the significance of our Constitution. | 5 |
| 7. | a) Discuss the Draft Constitution submitted by the Draft Committee | 8 |
| | b) Briefly explain the Preamble of Indian Constitution | 7 |
| 8. | a) Discuss the eligibility, election processes, powers, vetoes, actions on victim applications of the President of India. | 10 |
| | b) Discuss the Union Judiciary as per Indian Constitution. | 5 |
| 9. | a) Discuss Panchayat raj System / Local Self-Government/Self-Help Government systems | 9 |
| | b) Describe "Center-State relationship" in light of Indian Federalism. | 6 |
| 10. | a) Write the points on Principles of Democracy, Values of Democracy and Defects of democracy. | 5 |
| | b) Explain the Enforcing Rights through Writ. | 5 |
| | c) Describe the provisions for Women in Constitutional Provision. | 5 |
| 11. | a) Discuss the Adult Franchise / Suffrage system & Electoral process in India. | 9 |
| | b) Describe Fundamental Rights of Indian Citizenship. | 6 |
| 12. | a) Discuss the provisions for Schedule Caste & Schedule tribes in Constitutional Provision. | 5 |
| | b) Discuss provisions for Minority in Constitutional Provision. | 5 |
| | c) Write notes on (i) Human Rights (ii) Emergency Provisions by Indian Constitution. | 5 |

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CE/CE(PC)504/2022-23
2022
SOIL MECHANICS II

Full Marks: 70

Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.
Do not carry IS code in the examination hall.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions

5x2=10

1. What is the main cause of reduction of void ratio of soil during compaction? 2
2. What is the relation between slope angle β and angle of internal friction ϕ for a stable slope in case of dry cohesion less soil? 2
3. Draw qualitative variation of coefficient of active earth pressure with ϕ of cohesionless soil. 2
4. Determine ratio of bearing capacities of a circular and square footing of same width (diameter) placed on surface of same sand. 2
5. A footing is placed at 2m depth below G.L. $c-\phi$ soil, $\gamma = 16 \text{ kN/m}^3$. Gross bearing capacity of the footing is 100kPa. Determine net bearing capacity. 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *five* questions
=60

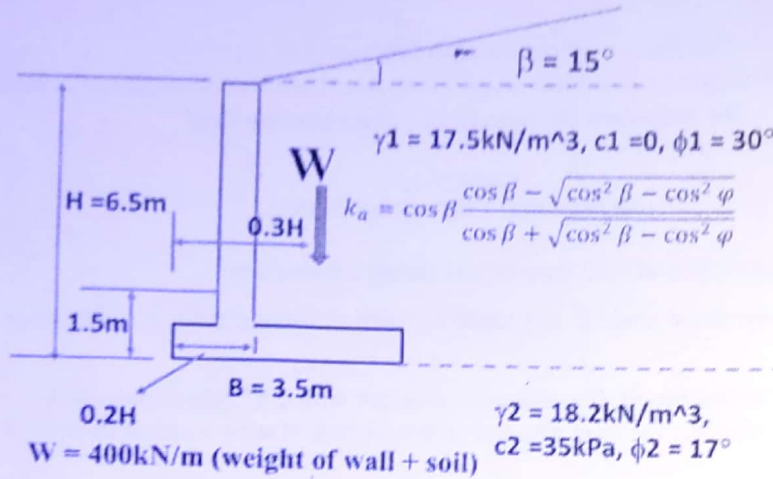
12x5

6. a) What is passive earth pressure? Draw orientation of major and minor principal stresses on the element which is on the verge of failure in passive earth pressure. 3
b) Determine active earth pressure on the retaining wall and design moment for the stem of the wall. Given: $H=6\text{m}$, base and stem thickness, $0.1H$, backfill slope $= 0$, cohesion less backfill having $\gamma = 16.4 \text{ kN/m}^3$, $\phi = 31.5^\circ$. Use Rankine theory to compute earth pressure. 4
c) Normally surface of a retaining wall is rough. If we consider the wall is smooth and use Rankine theory to determine earth pressure, what shall be the effect on stability of retaining wall? 2
d) If coal is dumped in a RCC framed building, whether wall of the building will be subjected to any lateral pressure. Explain. 2
e) True or false: Strain required to develop active earth pressure is less than that of passive earth pressure. 1
7. a) What is consolidation? 2
b) Which $e-\log p$ curve will give steep slope: NC clay in undisturbed state or NC clay in remolded state? 1
c) Write about minimum time required to complete a consolidation test. 1
d) Void ratio of a soil is 0.95 at pressure, 100kPa. At pressure 150kPa, void ratio is reduced to 0.82. Determine compression index, coefficient of compression and coefficient of volume compressibility. Given: $e_0 = 1.2$. 3
e) What is the effect of withdrawal of ground water in the context of settlement of foundation? Justify your answer. 2
f) Describe log-log method to determine pre-consolidation pressure. 3
8. a) Determine ratio of energy for heavy and light compaction test. 3
b) OMC and MDD of a silty clay soil is determined for different energies. Draw a qualitative line joining all OMC – MDD points in a dry density vs. water content plot. 2
c) How much soil is required for compaction test (light or heavy) in case of soil susceptible to break during test? 1
d) How compaction is affected by (i) speed of roller and (ii) frequency of vibratory roller. 2
e) Write a short note on following compaction control methods: End Product Method and Method of Specification. 3

f) Which terms is suitable to describe degree of compaction for a granular soil with 15% fines: Relative density or relative compaction?

9. a) Draw section of a counter fort retaining wall and label the different parts of the wall.

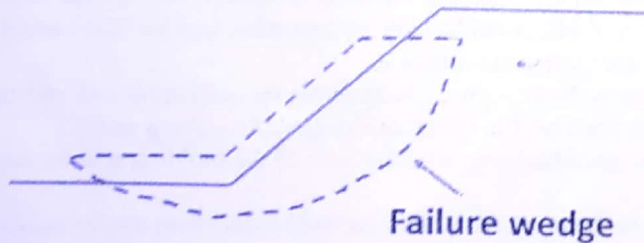
b) Determine Factor of Safety against overturning and sliding and determine contact pressure for the Retaining Wall shown in Figure below. Weight of wall plus soil and its location of action is given in the figure. Assume data reasonably if not supplied. Neglect passive earth pressure.



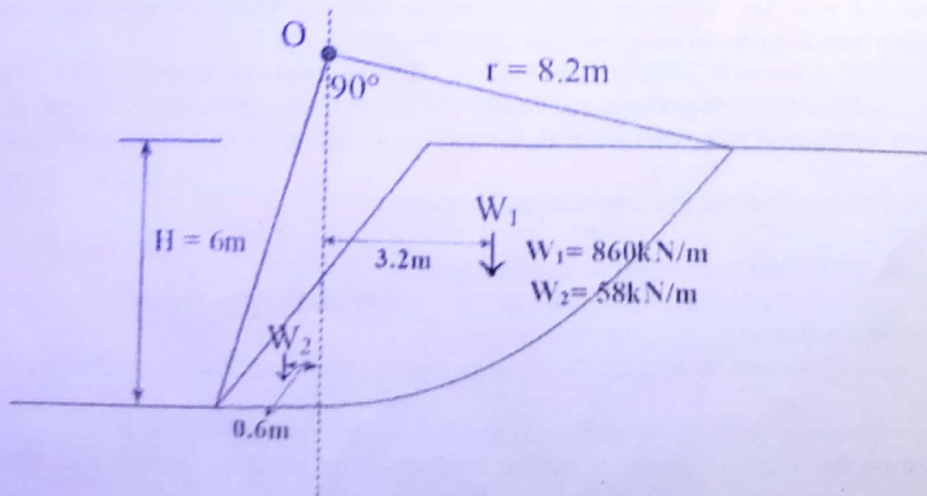
c) Comment on the locations of resultant of active earth pressure for the following cases: backfill with surcharge and without surcharge.

10. a) What are the different types of slope failure and what are the different causes of slope failure?

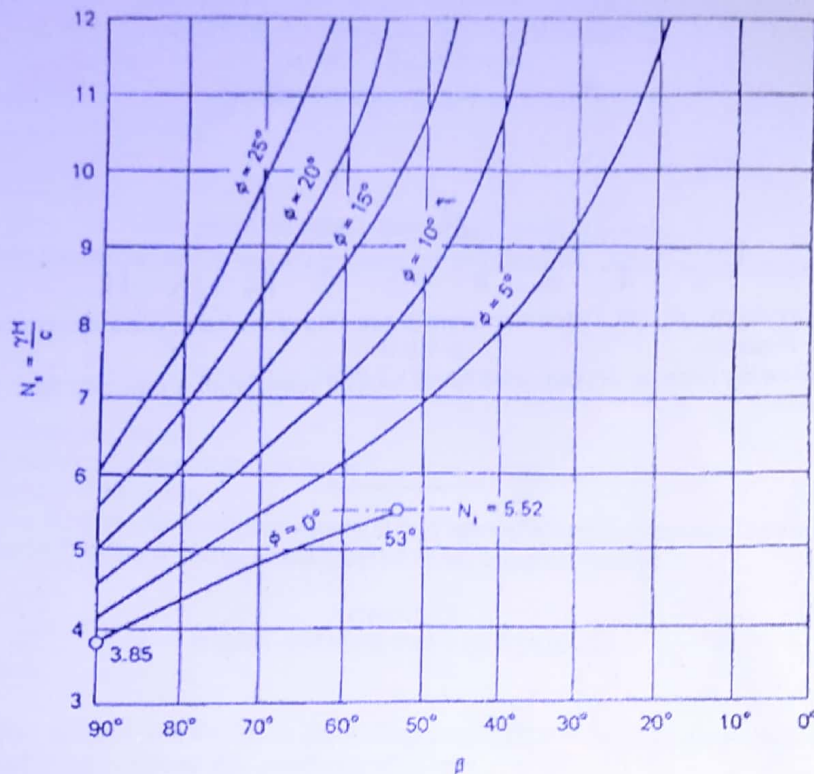
b) A slope failure is shown in figure. What type of slope failure it is? Comment on the strength parameters of the soil.



c) Factor of safety, FS = 1 for the slope in clay, shown in figure below ($\phi = 0$). Determine cohesion, c of the soil



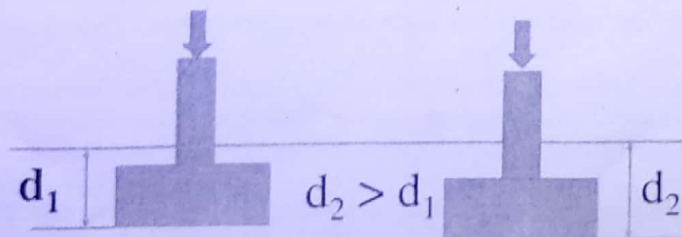
- d) Determine safe height of slope in $c-\phi$ soil using $FS = 1.5$. Given: $\beta = 60^\circ$, $\gamma = 18.2 \text{ kN/m}^3$, $c = 40 \text{ kPa}$ and $\phi = 10^\circ$.



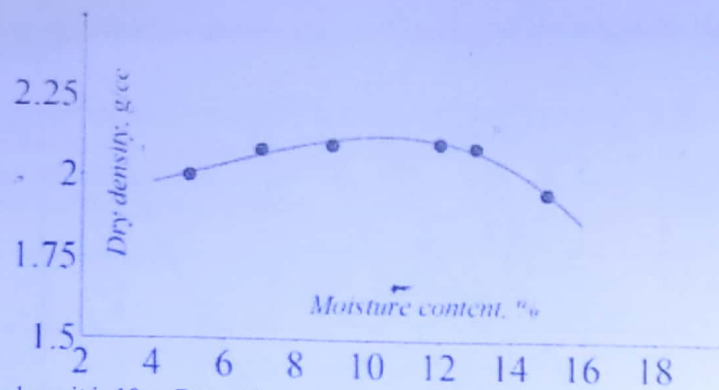
11. a) What are the different modes of failure of shallow foundation? What shall be probable characteristics of failure if a footing is placed at shallow depth in very dense sand and subjected to static loading? 3
 b) Determine ratio of bearing capacities of two footings of widths 2m and 6m placed on surface of clay, $c = 25 \text{ kPa}$, $\phi = 0$, $\gamma = 17 \text{ kN/m}^3$ 2
 c) Determine bearing capacity of a square footing of 2m width placed at 2m depth in sand as per IS 6403. 7
 Water table is located at 2.5m depth below G.L. Given: $\phi = 31.56^\circ$, $\gamma = 16.5 \text{ kN/m}^3$, $\gamma_{\text{sat}} = 18.2 \text{ kN/m}^3$

BEARING CAPACITY FACTORS			
ϕ (Degrees)	N_c	N_q	N_γ
25	20.72	10.66	10.88
30	30.14	18.40	22.40
35	46.12	33.30	48.03

12. a) Determine passive earth pressure developed in clay soils having $c = 50 \text{ kPa}$ at a depth $z = 0$. 2
 b) Comment on the settlement of footings (see figure below) with justification. All parameters are same except depth. 2



- c) For a compaction work, Relative Compaction of 98% is to be achieved. After field compaction density is determined as 1.91 g/cc . Laboratory compaction test result is shown below. Check whether the compaction works fulfill the criteria or not 3



- d) Thickness of a clay deposit is 10m. Determine average consolidation after 5 years. Given: $c_v = 0.75 \text{ m}^2/\text{year}$. Double drainage condition. 3
- e) Which of the following material do you select for a backfill material of a retaining wall: Clay and sand? Justify your answer. 2

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CE/CE(PC)503/2022-23
2022
STRUCTURAL ANALYSIS I

Full Marks: 70

Times: 3 Hours

*The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.*

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions

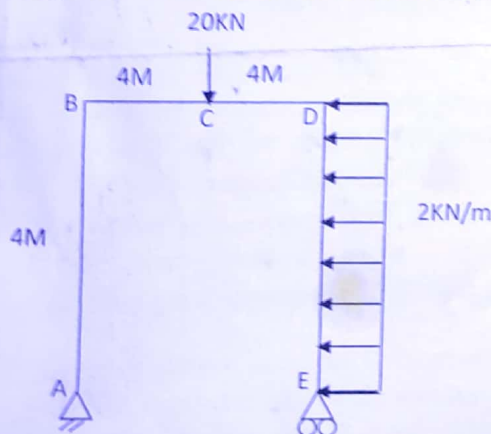
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|----|--|--------|---|
| 1. | What is degree of indeterminacy? | 5x2=10 | 2 |
| 2. | What is an arch? How it is different from a beam? | | 2 |
| 3. | Define first theorem of Castigliano | | 2 |
| 4. | Draw influence line diagram for bending moment at mid span of a simply supported beam of length "L". | | 2 |
| 5. | What is strain energy? What are the different types of strain energy? Explain. | | 2 |

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions

4x15=60

6. Draw the axial force diagram (AFD), Shear force diagram (SFD) and bending moment diagram (BMD) of the following portal frame. Assume uniform flexural rigidity. 15



7. A parabolic arch hinged at the springing and crown has a span of 20m. the central rise of the arch is 4m. It is loaded with a uniformly distributed load of intensity 2KN/m on the left 8m length. Calculate 15
 (a) The direction and magnitude of reaction at the hinges.
 (b) The bending moment, normal thrust and radial shear at 4m and 15m from the left end.
8. (i) A simply supported beam of span l carries a concentrated load at a distance a from the left hand side support. Using Castigliano's theorem, determine the deflection under the load. Assume uniform flexural rigidity. 9
 (ii) Determine the mid span deflection of a simply supported beam of span L carrying a udl w per unit length. 6
9. (i) A symmetrical parabolic arch with a central hinge, of rise r and span L , is supported at its ends on pins at the same level. Show that there is no bending moment at any point in the arch rib when a udl of intensity w per unit length covers the whole span. 6
 A parabolic arch, hinged at the ends has a span of 30m and rise 5m. A concentrated load of 12KN acts at 10m from the left hinge. The second moment of area varies as the secant of the slope of the rib axis. Calculate the horizontal thrust at the hinges. 9

10. Calculate the fixed end moments of a fixed beam of span 'l' and carrying a uniformly distributed load of intensity w per unit length by the method of consistent deformation. Draw the BMD. 15
- ✓ 11. A uniformly distributed load of length 5m and intensity 40 kN/m crosses a simply supported beam of span of 15m. Draw the influence line diagram for the shear force and bending moment at a section 6m from left end. Using influence lines, find the maximum shear force and bending moment at this section. 15
- ✓ 12. Four wheel loads of 8, 15, 15 and 10 kN have centre to centre spacing of 2m between consecutive loads and they cross a girder of 30 m span from the left to right with 10 kN wheel load leading. Calculate the maximum B.M. and shear force at 8m from the left support. 15

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JGEC/B.TECH./ CIVIL ENGINEERING/CE(PC)501/2022-23
2022

Design of Reinforced Concrete Structures

Full Marks: 70

Times: 3 Hours

The figures in the margin indicate full marks.

Candidates are requested to write their answers in their own words as far as practicable.

IS 456 and SP 16 are allowed to use.

Assume any reasonable data, if required

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer **all** questions

5x2=10

1. Explain how the extreme concrete fiber flexural stress of $0.446 f_{ck}$ in the compression stress block of concrete as per BIS in limit state method of RCC design is arrived at.
An under reinforced RCC beam section is designed for flexure using Fe-415 grade steel. During construction Fe-600 is used instead of Fe-415 keeping all the parameters same. Make your comments.
2. Name the common Ultimate Limit States and Serviceability limit states.
3. Why under reinforced section is adopted for flexural design of RCC beam section?
4. Mark pictorially the development length in tension and compression for column bars in footing slab.

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any **four** questions

4x15=60

6. A simply supported singly reinforced RCC beam of size: width = 300mm, gross depth = 500mm & clear cover to main reinforcement = 40mm, having clear span 5.0m and support width 300mm measured along length of the beam, subjected to live load 30kN/m is reinforced with $(2-20mm\phi + 2-16mm\phi)$ longitudinal steel in the tension zone at mid-span. Also, the beam is provided 2-legged shear reinforcement of diameter 8mm at the rate of 150mm c/c throughout. Determine the appropriate location where 2-16mm ϕ steel can be curtailed satisfying IS 456 requirements. Use M25 grade concrete and Fe 500 grade steel.
7. Determine the gross thickness of an RCC interior floor slab panel of size $3m \times 4.0m$ and determine the reinforcements for short direction only assuming clear cover 25mm and draw the corresponding section as per short-cut detailing rule. It is subjected to uniformly distributed live load of $3.0kN/m^2$. Consider top floor finish as 15mm marble over average 30mm base mortar and bottom floor finish 10mm thick plaster. Use M20 grade concrete and Fe500 grade steel. Densities of marble, reinforced concrete, base mortar, plaster are 2.76gms/cc, 2.5gms/cc, 2.0gms/cc and 2.0gms/cc respectively. Consider weight of false ceiling as $0.5kN/sqm$.
8. Design a short square column for longitudinal steel only and suggest minimum transverse reinforcements also with the following data:
Unsupported length of the column about both the axis = 3500mm; Size of column = 400mm x 400mm; Maximum diameter of main bars = 20mm; Diameter of link bars = 10mm; Clear cover = 50mm; Factored axial load = 1200kN; Factored moment acting about X-axis = 50 kN-m; Factored moment acting about Y-axis = 25 kN-m; Grade of steel = 500MPa and Grade of concrete = M25.
9. Design a suitable square footing of uniform thickness for the column of Problem No. 8 considering two-way punching shear only. Design details drawings not required. The safe bearing capacity of soil is $200kN/m^2$. Use M25 grade concrete and Fe 500 grade steel.

10. Draw the bending moment for one intermediate flight of a stair case in a RCC beam-column framed residential building assuming 85% end fixity for the waist slab showing key values of bending moments at supports and at mid-point at least. The 1.5m wide, measured from center line of beam, mid-landing as well as floor level landing slabs of the flight frame monolithically into a beam at both ends. The vertical distance traversed by the flight is 1.5m. Take, waist slab thickness = 200mm, rise = 150mm and tread = 270mm. Width of both beams 300mm. Consider finishes as in Problem No. 7.

11. Design a ductile doubly reinforced rectangular RCC beam section subjected to ultimate bending moment of 310kN-m, using first principle of LSM, having following details: width of the beam section = 350mm; gross depth of the beam = 500mm; clear cover to both tensile as well as compression steel = 40mm; and diameter of stirrups is 10mm. Use M25 grade concrete and Fe 500 grade steel.

12. A beam segment (one span) of a continuous beam, having clear span 4.0m and gross cross section 300mm x 450mm, whose both supports are subjected to ultimate bending moment of 90kN-m and the mid-span is subjected to ultimate bending moment of 60kN-m. Determine the reinforcements required at the sections as SR-URS and draw the neat design drawing showing main reinforcement details as well as all relevant dimensions for beam segment using short-cut detailing rules. Use M25 grade concrete; Fe-500 grade steel.

Steps likha de

$$A = \text{km}^2$$

$$t_c = 55 \text{ min} = 0.92 \text{ hr}$$

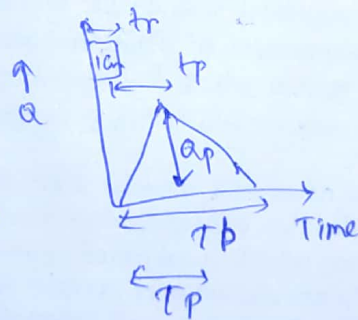
$$t_r = 30 \text{ min} = 0.5 \text{ hr}$$

$$t_p = 0.6 t_c$$

$$T_p = t_r/2 + t_p$$

$$T_b = 2.67 T_p$$

$$Q_p = 2.08 \text{ m}^3/T_p$$



Trial 1

$$\phi = \frac{\text{Cum rainfall} - \text{Surff}}{T} = \frac{7.7 - 3.5}{5}$$

Trial 2

$$\phi = \frac{\text{Total rainfall} - \text{surff}}{T} = \frac{6.8 - 3.5}{3.5}$$

$$\phi_{\text{indm}} = 0.943 \text{ cm/hr}$$

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
COE/B.TECH./CE/CE(PC)506/2022-23
2022
TRANSPORTATION ENGINEERING

Full Marks: 70

Times: 3 Hours

The figures in the margin indicate full marks.

All the notations have their usual meanings unless specifically mentioned.

Candidates are requested to write their answers in their own words as far as practicable.

Please write the answer of all part questions of a broad type question successively as far as practicable.

Note: Please supply a mm graph paper along with the answer script.

GROUP-A

Answer all questions

5×2=10

[OBJECTIVE TYPE QUESTIONS]

1. Classify the roads as per third 20 year road development plan, 1981-2001. 2
2. Write down the effect of gradient on overtaking sight distance. 2
3. In which type of curve comfort condition is not required to be considered for design? Explain. 2
4. What is the significance of finding *equivalent wheel load factor* or *vehicle damage factor*? 2
5. A plate bearing test was carried out on a subgrade using a 76 cm diameter rigid plate. A deflection of 1.25 mm was caused by a pressure of 0.84 kg/cm². Find the modulus of subgrade reaction. 2

[LONG ANSWER TYPE QUESTIONS]

Answer any four questions

4×15=60

GROUP-B

6. i) Write down the main features of Macadam method of construction. 5
- ii) There are five alternative proposals of road plans for a backward district. Justify with reasons which proposal is the best assuming, utility units of 0.5, 1, 2, 4 and 8 for the five population ranges and utility units of 1 and 5 per 1000 tonnes of agricultural and industrial products served. 5

Proposal	Total road length, km	Number of towns and villages served with population range					Productivity in thousand tonnes	
		<2000	2001-5000	5001-10000	10001-20000	>20000	Agricultural	Industrial
P	500	100	150	40	20	3	150	20
Q	600	200	250	68	28	3	220	25
R	700	270	350	82	36	8	300	35
S	800	280	410	91	41	4	400	42

- iii) Discuss the concept of Star and Grid pattern with the help of a neat sketch. 5

7. i) A car is moving at a speed of 80 kmph on road having 2% upward slope. The driver applies the brakes when he sees an obstruction. If his reaction time is 2 sec and coefficient of longitudinal friction is 0.35 calculate the distance traversed before it finally stops. 4
- ii) Derive the expression for finding OSD for two way traffic. 6
- iii) The stopping sight distance required for a highway is 80 m. Find the required clearance of obstruction from centerline of a circular curve of radius 300 m assuming the length of the curve is greater than the sight distance. 5
8. i) Calculate the maximum allowable speed on a horizontal curve of radius 350 m if the maximum allowable values of lateral coefficient of friction is 0.15 and rate of superelevation is 0.07. 4
- ii) The radius of a horizontal curve is 400m, the total pavement width at curve is 7.6 m and super elevation is 0.07. Design the transition curve length for a speed of 100 kmph. Assume pavement to be rotated about inner edge. 5
- i) A valley curve is formed by descending grade of 1 in 25 meeting an ascending gradient 1 in 30. Design the length of the valley curve to fulfill both comfort condition and head light sight distance requirements for design speed of 80 kmph. Assume any other data suitably, if required. 6
9. i) Determine the total thickness of a flexible pavement assuming single layer elastic theory using the following data: 4
- Design wheel load = 5100 kg; Tyre pressure = 7.0 kg/cm²
- Elastic modulus = 180 kg/cm²; Permissible deflection 0.25 cm
- ii) Sketch a typical flexible pavement cross-section, showing all component parts. Enumerate the functions and importance of each component of the pavement. 2+4
- iii) The traffic studies and axle load distribution studies carried out during project preparation indicated that there are 5
- i) 9800 vehicles /day with rear axle load 2500 to 3000 kg and growth rate 6.5%
- ii) 2800 heavy vehicles /day with rear axle load 11000 to 13000 kg and growth rate 4%
- The pavement is expected to be constructed in 2 years after this study and it has the design life of 15 years. Determine CSA in msa for design.

10.

i) Discuss the various warping conditions for cc pavement slab with the help of sketch. 6

ii) Design a rigid pavement making use of Wastergaard's wheel load and warping stress equations at edge region of the slab. The design data are given below. Bradbury's warping stress coefficient chart (given under) may be used. 9

Design wheel load (P) = 7000 kg; contact pressure(p)= 7.0 kg/cm²

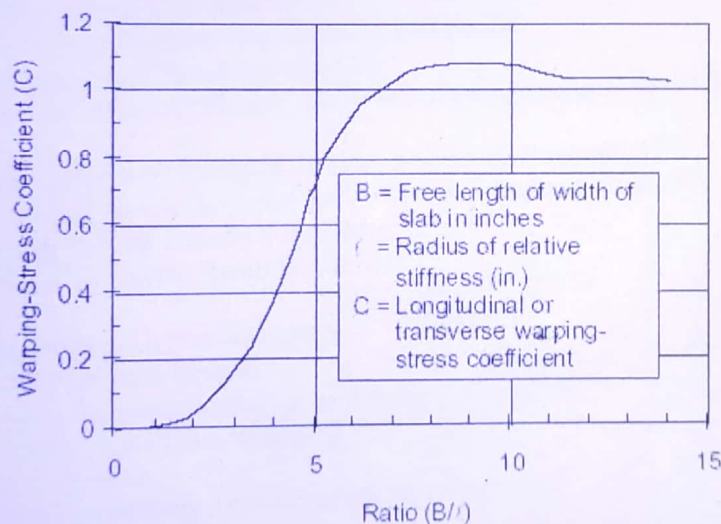
Spacing between longitudinal joints = 3.5 m; Spacing between contraction joints = 4.5 m

Elastic modulus of pavement materials = 3×10^5 kg/cm²; Poisson's ratio = 0.15

Thermal coefficient of CC per °C = 1×10^{-5} ; Flexural strength of CC = 45 kg/cm²

Modulus (K) of base course = 30 kg/cm²

Maximum temperature differential at the location for pavement thickness values of 22, 24, 26 and 30 cm are respectively 15.0, 15.6, 16.1 and 16.6 °C. Desired factor of safety w.r.t. load stress + warping stress at edge regions is 1.1 to 1.2.



11.

i) Define PCU and mention the various factors that affect PCU values. 2+3

ii) Determine the theoretical capacity of a traffic lane with one way traffic flow at a stream speed of 50 kmph Assume the average space gap between the vehicles to follow the relation $S_g = 0.278 Vt$ where t (the average reaction time) = 0.7 sec; assume average length of vehicle = 5 m. 4

- ii) Spot speed studies were carried out at a certain stretch of a highway with mixed traffic flow and the consolidated data collected are given below.

6

Speed range, kmph	No. of vehicles observed	Speed range, kmph	No. of vehicles observed
0 to 10	16	50 to 60	270
10 to 20	22	60 to 70	130
20 to 30	76	70 to 80	56
30 to 40	98	80 to 90	42
40 to 50	240	90 to 100	12

- iii) Determine (i) the upper and lower value or speed limits for installing speed regulation signs at this road stretch and (ii) the design speed for checking the geometric design elements of the highway.

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JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
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JGEC/B.TECH/CIVIL ENGINEERING/ CE(HS)401/2021-22
2022
CIVIL ENGINEERING: SOCIETAL & GLOBAL IMPACT

Full Marks: 70

Times: 3 Hours

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Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

5x2=10

Answer **all** questions

- | | | |
|----|---|-----|
| 1. | What are the common attributes of preindustrial revolution days? | 2 |
| 2. | What is "Green Infrastructure"? Give some examples of Green Infrastructure & Biodiverse Design. | 1+1 |
| 3. | Define "Climatology". What is "Earthen Infrastructure"? | 1+1 |
| 4. | Draw the Schematic representation of the five primary ecological effects of infrastructure which together lead to the fragmentation of habitat (Vander Zande et al., 1980). | 2 |
| 5. | What is "LEED"? What are the different categories of LEED certified buildings in India? | 1+1 |

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

12x5=60

- | | | |
|----------------------------------|---|---|
| Answer any five questions | | |
| 6. | i) Discuss about "The Agricultural Revolution". | 4 |
| | ii) Discuss about the "Crop Rotation" introduced in this period. | 4 |
| | iii) Discuss about invention of "Threshing Machine". | 2 |
| | iv) Discuss about the invention of "Plough" in the era of the agricultural revolution. | 2 |
| 7. | i) What is "The Enclosure Act" in regard of The Agricultural Revolution? | 3 |
| | ii) Describe how "The Enclosure Act" was implemented in England during this era. | 4 |
| | iii) Discuss about "The Second Industrial Revolution". | 3 |
| | iv) Write about "The First Usable Steam Engine". | 2 |
| 8. | i) Write down the importance of maintenance. | 2 |
| | ii) What are the causes of deterioration? | 2 |
| | iii) Write any two tests for assessment of frost damage? | 2 |
| | iv) How can you control cracks in a structure? | 2 |
| | v) Define aggregate splitting. | 2 |
| | vi) What are the factors affecting chemical attack on concrete? | 2 |
| 9. | i) What is a Green Building? | 2 |
| | ii) What the salient features of a Green Building? | 3 |
| | iii) Discuss about the different benefits of Green Buildings. | 7 |
| 10. | i) Discuss about the merits and demerits of Hyperloop Transportation System. | 3 |
| | ii) What is the Basic Principle of Hyperloop? | 3 |
| | iii) What are the different parts of the Hyperloop Transportation System? Discuss with neat sketches. | 6 |
| 11. | i) What are the projects or buildings for which specific LEED rating programs exist in Indian Green Building Rating system? | 2 |
| | ii) Describe the different categories of green buildings as per LEED rating system. | 2 |
| | iii) Discuss about the Green Building rating system with examples, the available points under 6 (six) categories like Sustainable Sites, Indoor Environmental Quality etc. | 6 |
| | iv) In a major boost to the LEED rating system, General Services Administration (GSA) USA recently compared 5 rating systems and found the LEED system to be the most credible among five systems evaluated. What are they? | 2 |

- | | | | |
|-----|------|--|---|
| 12. | i) | Define Environmental Sustainability. | 2 |
| | ii) | What is Resilience in ecology? | 2 |
| | iii) | Draw the Venn diagram of Sustainable Development: at the confluence of three constituent part. | 2 |
| | iv) | What are the functions of an Environmental Engineer? | 3 |
| | v) | Draw a typical Water Treatment System Layout. | 3 |
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