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C020512(020)

B. Tech. (Fifth Semester) Examination, Nov.-Dec. 2023

(New Scheme)

(Civil Engg. Branch)

HYDROLOGY and WATER RESOURCES ENGINEERING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

*Note : Attempt all questions. Part (a) from each question is compulsory & carry equal 4 marks. Attempt any **two** parts from (b). (c) and (d) of each question & carries equal 8 marks.*

Unit-I

1. (a) Define Precipitation.   4

    (b) Describe the various forms of precipitation.   8

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(c) Describe hydrological cycle with neat sketch.   8

(d) Discuss climate and weather condition season in India.   8

Unit-II

2. (a) Define unit hydrograph.   4

(b) What is flow duration curve? Explain in detail.   8

(c) Write short note on :   8

   (i) Base flow separation

   (ii) Effective rainfall

(d) Explain various components of hydrograph.   8

Unit-III

3. (a) Define Duty and Delta .   4

(b) Define evapotranspiration. What are the various methods to measure it?   8

(c) Explain the process to determine irrigation requirement of crops.   8

(d) What are the various factors affecting duty? Explain in details.   8

Unit-IV

4. (a) Define lining of canal.   4

(b) Explain in detail Kennedy's method of unlined canal design.   8

(c) Write in detail about effects causes and remedial measures adopted for water logging.   8

(d) Describe Laceys's method of unlined canal design.   8

Unit-V

5. (a) Define reservoir sedimentation in detail.   4

(b) Elaborate the various types of reservoirs.   8

(c) Describe the process to determine reservoir capacity for a specified yield from the mass inflow curve.   8

(d) Explain with diagram various zones of reservoir.   8

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C020513(020)

B. Tech. (Fifth Semester) Examination, Nov.-Dec. 2023

(New Scheme)

(Civil Engg. Branch)

GEOTECHNICAL ENGINEERING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. From all the units part a is compulsory and from remaining parts attempt any two parts.*
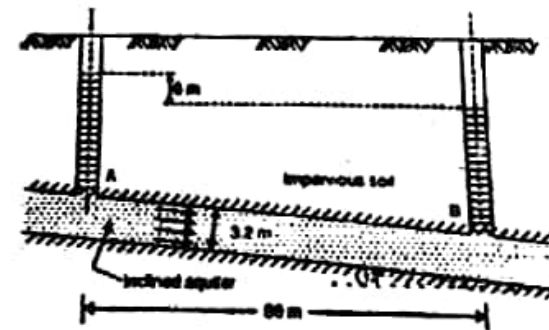
Unit-I

1. (a) Differentiate between physical and chemical weathering.   4

(b) Explain three-phase system of soil in terms of weight, volume, voids ratio, and porosity. Derive $eS = wG$, where e = voids ratio, S = Degree of saturation, w = water content, G = specific gravity.　　8

(c) Explain Indian Standard Soil Classification System in detail.　　8

(d) An undisturbed saturated specimen of clay has a volume of 18.9 cm³ and a mass of 30.2 g. On oven drying, the mass reduces to 18.0 g. The volume of dry specimen as determined by displacement of mercury is 9.9 cm³. Determine shrinkage limit, specific gravity, shrinkage ratio and volumetric shrinkage.　　8

Unit-II

2.　(a) Define Darcy's law.　　4

(b) Define Compaction. List and explain the factors affecting compaction.　　8

(c) Explain stress conditions in soil for effective and neutral pressures for submerged soil mass with a neat sketch.　　8

(d) Fig. shows an aquifer inclined at 12° to the horizontal. Two observation wells, dug upto the aquifer, at a horizontal distance of 80 m show a difference of 6 m in the water levels. Taking coefficient of permeability of aquifer soil as 1.2 mm/sec, determine the discharge through the aquifer, per unit width. The thickness of aquifer normal to the direction of flow is 3.2 m.　　8

Unit-III

3.　(a) Differentiate between compaction and consolidation.　4

(b) Explain Tarzaghi's theory of consolidation.　　8

(c) Explain direct shear test method. What are the advantages of direct shear test?　　8

(d) Two clay specimens A and B, of thickness 2 cm and 3 cm, have equilibrium voids ratio 0·68 and 0·72 respectively under a pressure of 200 kN/m². If the equilibrium voids ratios of the two soils reduced to 0.50 and 0.62 respectively, when the pressure was increased to 400 kN/m², find the ratio of the co-efficients of permeability of the two specimens. The time required by the specimen A to reach 40 percent degree of consolidation is ¼ of that required by specimen B for reaching 40% degree of consolidation.   8

Unit-IV

4. (a) Define finite and infinite slope. What are the general causes of failure of slopes.   4

(b) Explain with sketch in detail friction circle method for analyzing of finite slope.   8

(c) A slope is to be constructed at an inclination of 30° with the horizontal. Determine the safe height of the slope at factor of safety of 1.5. The soil has the following properties : $C = 15$ kN/m², $0 = 22.5°$ & $y = 19$ kN/m².   8

(d) A temporary cutting 8 m deep is to be made in a clay having a unit weight of 18 kN/m³ and an average cohesion of 20 kN/m². A hard stratum of rock exists at a depth of 12 m below the ground surface. Use Taylor's stability curves to estimate if a slope 30° is safe. Given : $i = 30°$, $S_n = 0·163$.   8

Unit-V

5. (a) Explain various methods of site exploration and soil investigation.   4

(b) Describe in detail different methods of boring.   8

(c) What is penetrometer test? Explain the procedure with a neat sketch.   8

(d) Explain various geographical and advance soil exploration methods.   8

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B. Tech. (Fifth Semester) Examination
Nov.-Dec. 2023

(New Scheme)

(Civil Engg. Branch)

TRANSPORTATION ENGINEERING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) from each question is compulsory and answers any two of the remaining (b), (c) and (d).

Unit-I

1. (a) Enlist the requirements of a highway alignment.   4

   (b) Discuss with neat sketch the various controlling factors of the alignment of highway.   8

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(c) Calculate the stopping sight distance for a NH with design speed 100 kmph. 8

(d) Aligning a highway in a built up area it was necessary to provide a horizontal curve of radius 400 m. Design following geometric features. 8

(i) Super elevation

(ii) Extra widening of pavements.

(iii) Length of transition curve.

(iv) Shift.

Design speed 80 kmph, pavement width 7·5 m, length of wheel base 6m.

Unit-II

2. (a) List the objective and uses of : 4

(i) Origin and Destination Studies

(ii) Parking Studies.

(b) Explain the following with neat sketch and example : 8

(i) Regulatory Sign

(ii) Warning Sign

(iii) Informatory Sign

(c) Discuss the application of I.T.S in Traffic Management. 8

(d) Design a rotary intersection for traffic flow in an urban section. At the intersection of two highways in the design year are given. 8

Approach	Left Turning			Straight Ahead		
	Cars	Commercial	Scooters	Cars	Commercial	Scooters
N	200	50	100	250	100	150
E	180	60	80	220	50	120
S	250	80	100	150	50	90
W	220	50	120	180	60	100

Right Turning		
Cars	Commercial	Scooters
150	50	80
200	40	120
160	70	90
250	60	100

Unit-III

3. (a) Draw the neat sketch of flexible and rigid pavement component. 4

(b) Describe the desirable properties of aggregates? List the tests involved in determining these properties. 8

(c) Determine the warping stress at interior edge and corner of a 25 cm thick cement concrete pavement with transverse points at 5 m interval and longitudinal joints at 3·6 m intervals. The modules of sub grade reaction k is 6·9 kg/cm³. Assume Max. temperature differential during day to be 0·6°C per cm slab thickness (for warping stress at interior and edge) and max temp. Differential of 0·4°C per slab thickness during night (for warping stress at the corner). Additional data given. 8

$(e = 10 \times 10^{-6}$ per °C, $E = 3 \times 10^5$ kg/cm²

$\mu = 0.15$, $C_x = 0.88$, $C_y = 0.54)$.

(d) Differentiate between flexible and rigid pavements. 8

Unit-IV

4. (a) Describe in briefly components of Permanent Way. 4

(b) Explain with neat sketch and suitable example conning wheels. 8

(c) Classify the different types of sleepers used in Indian railway. 8

(d) Describe briefly tems wear and explain its causes and prevention. 8

Unit-V

5. (a) Differentiate between direct and indirect taxes. 4

(b) Describe the various Gradients in Railways? Explain Grade Compensation. 8

(c) Design turnouts with 1 in 16 crossing from the following data : 8

  (i) Gauge = 1·676 m

  (ii) Heel Divergence = 13·3 cm

  (iii) Straight arm between T.N.C. and tangent point of crossing curve = 0·85 m

  (iv) Angle of crossing = 3° 34′ 35″

  (v) Angle of switch = 1° 34′ 27″

(d) Calculate the maximum permissible speed on a curve of high speed B.G. track having following particulars. 8

* Degree of Curve = 1°

* Amount of super elevation curve = 12 cm

* Length of transaction curve = 150 m

* Maximum speed of the section likely to be sanction = 175 kmph.

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C020531(020)

B. Tech. (Fifth Semester) Examination Nov.-Dec. 2023

(New Scheme)

(Civil Engg. Branch)

STRUCTURAL ANALYSIS-II

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) from each question is compulsory and carries 4 marks. Attempt any **one** part from parts (b) & (c) of each unit and carries 16 marks Assume suitable data if necessary.

Unit-I

1. (a) Disquss the difference between Force and Displacement methods of structural analysis. 4

   (b) Analyze the continuous beam as shown in figure, using three moment equation and Draw the BMD. 16
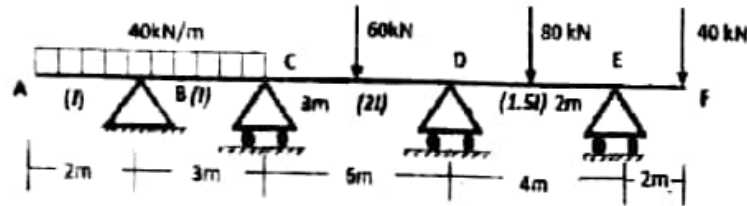
(c) Analyze the continuous beam shown in the figure, using three moment equation. Draw shear force and Bending moment diagram, if support B sinks by 5 mm under the given load. E = 2·1 × 10⁵ N/mm² and I = 9300 cm⁴.   16
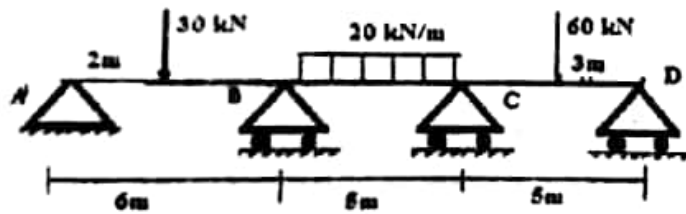
Unit-II

2. (a) Discuss Maxwell reciprocal theorem and Betti's law with suitable example.   4
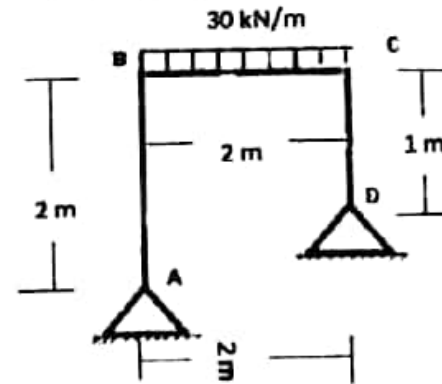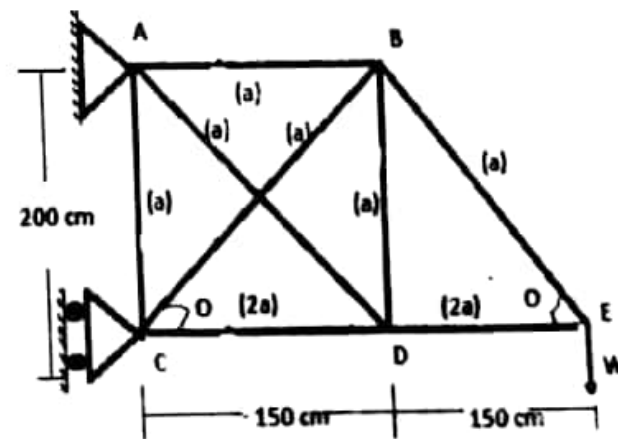
(b) Analyse the portal frame shown in figure, using

method of minimum strain energy and plot the bending moment diagram. EI is constant.   16

(c) Find the axial force in the member BC of the truss shown in Figure. The figures in breackets indicates the cross-sectional area in cm². All the Members are of the same material.   16
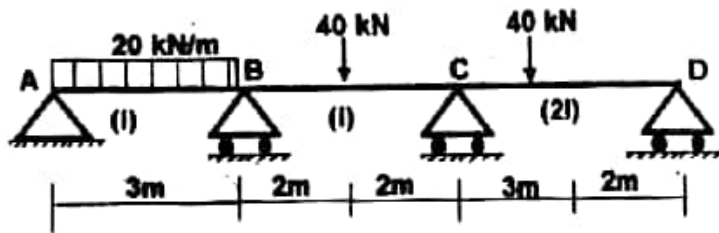
Unit-III

3. (a) What do you mean by term Absolute Stiffness, Relative stiffness, carry over moment and carrry over factor.   4

(b) Analyse the continuous beam ABCD as shown in figure by moment distribution method. Draw the bending moment diagram.   16

(c) Using the moment distribution method, determine the end moments of the members of the frame shown in fig. and draw the bending moment diagram. EI is the same throughout.   16
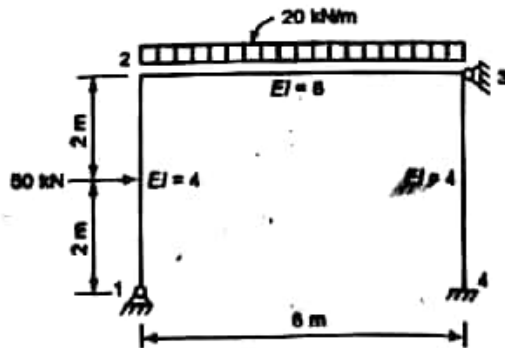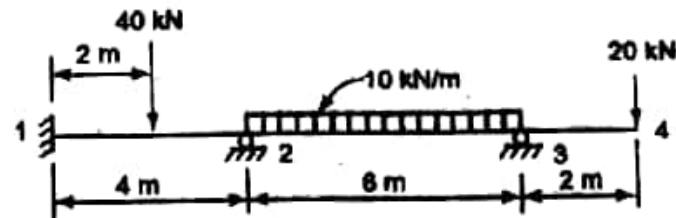
Unit-IV

4. (a) Discuss the Basics of Column analogy method with suitable diagram.   4

(b) A continuous Beam is supported and loaded as shown in figure. During loading support 2 sinks by 10 mm. Analyse the beam using slope deflection method and draw the bending moment diagram.
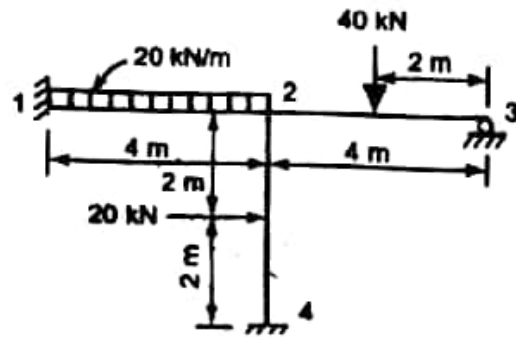
$E = 200 \times 10^6 \, kN/m^2$ and $I = 100 \times 10^6 \, mm^4$

constant throughout.   16

(c) Analyze the Frame shown in figure by slope deflection method and draw the Bending moment diagram.   16
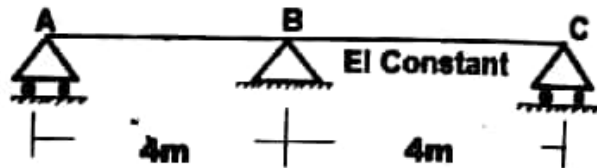
40 kN

20 kN/m

2 m

1 ⬚⬚⬚⬚⬚⬚⬚⬚⬚ 2

3

**4 m**

4 m

2 m

20 kN

2 m

4

Unit-V

5. (a) Draw the Qualitative influence line diagram for reaction at propped support and moment at the fixed support end of the propped cantilever beam. 4

(b) Determine the Influence line for R_A for the continuous beam shown in fig. Compute the ordinate at every 1 m interval. 16

A

B

C

El Constant

4m

4m

(c) Determine the Influence line for the shear force at D, the middle point of span BC, of a continuous beam shown in figure. Compute the ordinates at 1 m interval. 16

A **El Constant** B D C

4m **2 m** **2 m**

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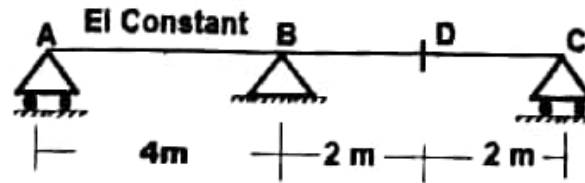
C020532(020)

B. Tech. (Fifth Semester) Examination, Nov.-Dec. 2023

(Civil Engineering Branch)

REPAIRS and REHABILITATION of STRUCTURES

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) from each question is compulsory. Attempt any **two** parts from (b), (c) and (d). Draw neat sketches where required.*

Unit-1

1. (a) Define the term quality assurance in concrete streutures. What are the factor affecting chemical attack on concrete?   4

(b) Define durability of concrete. How much importance should be given for durability in design and construction?   8

(c) Explain the thermal properties of concrete.   8

(d) What are the parameters affecting the quality of concrete?   8

Unit-II

2. (a) Write the effect due to temperature in a concrete.   4

(b) Explain in detail about the effect due to chemical in concrete.   8

(c) Elaborate in detail any two corrosion protection methods.   8

(d) With sketch explain the possible design and construction errors.   8

Unit-III

3. (a) Define Repair. What are the steps in selecting a repair procedure?   4

(b) Illustrate the deterioration mechanism.   8

(c) Elaborate on the scope and objectives of investigations.   8

(d) What is Maintenance? Explain the facets and importance of maintenance with various inspection procedures.   8

Unit-IV

4. (a) What is the method of production of high strength concrete?   4

(b) Discuss the procedure of properties, manufacture and uses of fibre reinforced concrete.   8

(c) Explain the various test methods of Self compacting concrete.   8

(d) Briefly explain about the manufacturing process and application of expansive cement.   8

Unit-V

5. (a) Discuss about the process of guniting Explain about vacuum concrete.   4

[4]

(b) Give a brief note on shoring and underprinning in demolition. 8

(c) Explain the process of epoxy injection. Also explain routing and scaling with sketches. 8

(d) Explain the different repair methods of various types of cracks. 8

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C020511(020)

B. Tech. (Fifth Semester) Examination,

Nov.-Dec. 2023

(AICTE Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN-I

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) from each question is compulsory. Attempt any two in Unit I, II, III and IV. Any one question in unit V. Assume suitable data if required. Use of IS 456 : 2000.*

Unit-I

1. (a) What are the difference between working stress method and limit state method.   4

C020511(020)   PTO

(b) Find the moment of resistance of a singly reinforced concrete beam of 160 mm wide and 300 mm deep to the centre of reinforcement, if the stresses in steel and concrete are not to exceed 140 N/mm^2 and 5 Nmm^2. The reinforcement constists of a 4 bars of 16 mm diameter. Take $m = 18$. If the beam is used over an effective span of 5 m, find the maximum load the beam can carry, inclusive of its own weight. Use working stress method. (Use W.S.M.)   8

(c) A RCC beam 250 mm wide and 400 mm effective depth is subjected to a shear force of 95 kN at the supports. The tensile reinforcement at the support is 0.5%. Find the spacing of 12 mm diameter 2-legged stirrups to resist the shearing stress at support, for M15 concrete. Use mild steel reinforcement. (Use W.S.M.)   8

(d) A reinforced concrete section is subjected to a reverse of bending moment of equal magnitude of 120 kN-m in either direction. Design the section of the permissible stresses in concrete and steel are 6 N/mm^2 and 140 mm^2 respectively, and $m = 15$. Assume $b = 0.6d$ and effective cover to steel equal to 0.1d. (Use W.S.M.)   8

Unit-II

2. (a) Write the IS code provision about safety and serviceability requirements for structural design in concrete.   4

(b) A reinforced concrete beam has width equal to 300 mm and total depth equal to 700 mm, with a cover of 40 mm to the centre of the reinforcement. Design the singly reinforced beam if it is subjected to a total bending moment of 150 kN-m. Use M20 and HYSD bars of grade 415. (Use L.S.M.)   8

(c) Design the reinforced for a RCC beam 300×400 mm of grade M20, to resist a moment of 150 kN-m. Use mild steel. (Use L.S.M.)   8

(d) A simply supported RCC beam 250 mm wide and 450 mm effective depth is reinforced with a 4-18 mm diameter bars. Design the shear reinforcement of beam and beam is subjected to shear force of 150 kN. Use M20 and Fe415 grade of steel bars.   8

Unit-III

3. (a) Define one way and two way slab.   4

(b) Design the T-beam has width and thickness of flange is 750 mm and 90 mm respectively, web thickness is 250 mm and effective depth of web is 500 mm. Applied moment 230 kN-m. Use M20 and Fe 415 grade of steel bars.　　　　　　　　　　8

(c) Design the dog-legged stair for a building in which the vertical distance between floors is 3·6 m. The stair hall measures 2·5 m × 5 m. The live load may be taken as 2500 N/m². Use M20 and Fe 415 grade of steel bars.　　　　　　　　　　8

Or

(d) Design the one-way continuous slab of Figure-1 subjected to uniformly distributed imposed loads of 5 kN/m² using M20 and Fe 415. The load of floor finish is 1 kN/m². The span dimensions shown in the figure are effective spans. The width of beams at the support = 300 mm.　　　　　　　16
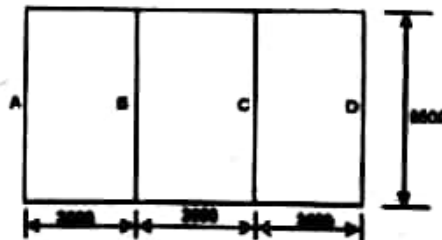

Fig. 1

Unit-IV

4. (a) (i) Eccentrically loaded columns have to be designed for combined axial forces and ....

　　　(ii) What is the recommended value of effective length if the column is effectively held in position and fixed against rotation in both ends?　　4

(b) Design a short RCC column to carry an axial load of 1600 kN. It is 4 m long, effective held in position and restrained against rotation at both ends. Use M20 and Fe 415 grade of steel bars.　　8

(c) Design a circular column of diameter 400 mm subjected to load 1200 kN. The column having spiral ties. The column is 3 m long and effectively held in position at both ends and not restrained against rotation. Use M25 and Fe 415 grade of steel bars.　　　　　　　　8

Or

(d) Design the reinforcement to be provided in the short column is subjected to P_u = 2000 kN, M_{ux} =130 kN-m (about the major principal axis) and M_{uy} =120 kN-m (about the minor principal axis). The unsupported length of the column is 3·2 m, width b

= 400 mm and depth D = 500 mm. Use
M25 and Fe 415 grade of steel bars for the design. 16

Unit-V

5. (a) What are the codal provisions for design of Isolated
   footings in IS 456?   4

   (b) Design an isolated footing of uniform thickness of a
   RC column bearing a vertical load of 600 kN and
   having a base of size 500×500 mm. The safe bearing
   capacity of soil may be taken as 120 kN/m². Use
   M20 concrete and Fe 415 steel bars.   16

   (c) Design a square footing has to transfer a dead load
   of 1000 kN and an impose load of 400 kN for a
   square column 400 mm × 400 mm (with 16 mm
   bars). The safe bearing capacity of soil may be
   taken as 2000 kN/m². Use M20 and Fe 415 grade
   of steel bars. Assume wt. of footing = 100 kN.   16

Chart-44 COMPRESSION WITH BENDING—Rectangular

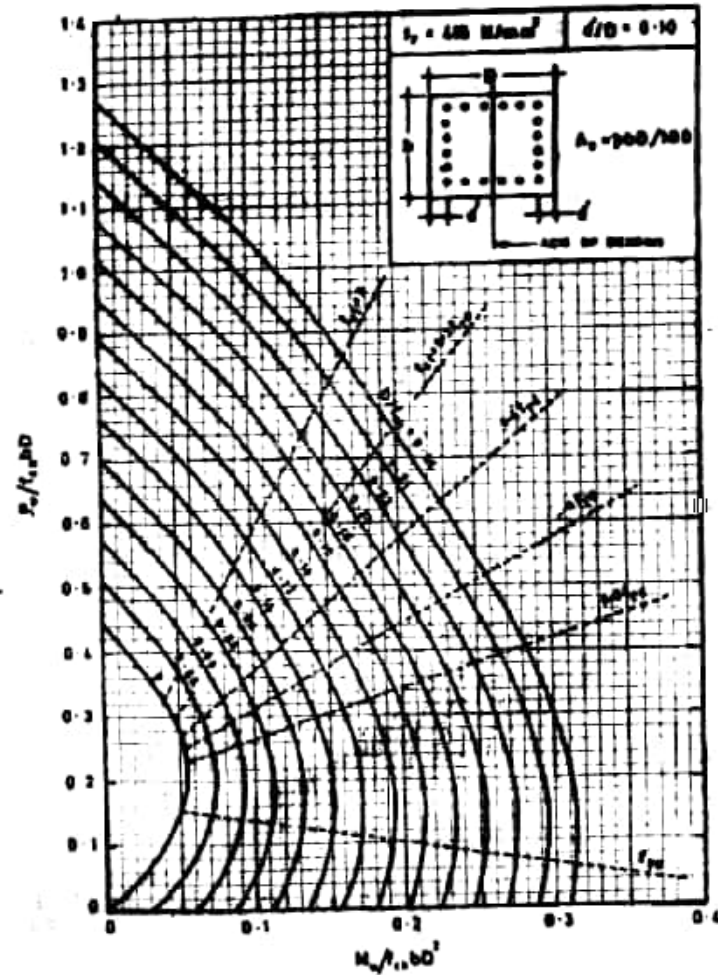**Section— Reinforcement Distributed Equally on four Side**

Chart-45 COMPRESSION WITH BENDING—Rectangular

Section— Reinforcement Distributed Equally on four Side

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