F 6337

(Pages : 4)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Common to all branches except C.S. and I.T.

EN 010 501-A—ENGINEERING MATHEMATICS – IV

(Regular/Improvement/Supplementary—New Scheme)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. State the necessary and sufficient conditions for a function to be analytic. Write one example for an analytic function.

2. Evaluate $\int_0^{2+i} (\bar{z})^2 \, dz$, along the line $2y = x$.

3. Find a root of $x = \cos x$ using Bisection method.

4. Solve $y' = 3x^2 + y$ in $0 \le x \le 1$ by Euler's method taking $h = 0.1$, given $y(0) = 4$.

5. State the theorem on complementary slackness conditions.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Under the transformation $w = z^2$, obtain the map in the w-plane of the square with vertices $(0,0),(2,0),(2,2),(0,2)$ in the z-plane.

7. Expand $\frac{z^2-1}{(z+2)(z+3)}$, for $|z| > 3$ in Laurent's series.

8. Find a root of the equation $x^6 - x^4 - x^3 - 1 = 0$ correct to three decimal places using Regula-Falsi method.

Turn over

9. Solve $\frac{dy}{dx} = z - x, \frac{dz}{dx} = y + x$ with $y(0) = 1$, $z(0) = 1$ to get $y(0.1)$ and $z(0.1)$, using Taylor's method.

10. Maximize $z = 3x_1 + 2x_2$
subject to $3x_1 + 4x_2 \leq 12$
$2x_1 + 5x_2 \leq 10$
$x_1, x_2 \geq 0.$

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Show that the polar form of Cauchy-Riemann equations are $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial u}{\partial \theta}$ and hence deduce $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r}\frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0$.

(6 marks)

(b) Show that the map of the circle $|z| = 2$ under the transformation $w + 2i = z + \frac{1}{z}$ is an ellipse, and find its axes and centre.

(6 marks)

Or

12. (a) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic. Find a function V such that $f(z) = u + iv$ is analytic. Also express $f(z)$ in terms of z.

(7 marks)

(b) Find the image of the circle $|z| = 2$ under the transformation $w = z + 3 + 2i$.

(5 marks)

Module 2

13. (a) Evaluate $\oint_c \frac{z}{(z-1)(z-2)^2} dz$, where c is the circle $|z - 2| = \frac{1}{2}$. **(5 marks)**

(b) Evaluate by contour integration :

$$\int_{-\infty}^{\infty} \frac{\sin x}{x^2 + 4x + 5} dx.$$

(7 marks)

Or

14. (a) Using Cauchy's integral formula, evaluate $\int_c \frac{e^z}{(z+1)^4 (z-2)} dz$, where c is $|z-1| = 3$.

(6 marks)

(b) Evaluate $\int_0^\infty \frac{dx}{x^4+1}$ by contour integration. (6 marks)

Module 3

15. (a) By using Gauss-Seidel iteration method, solve the following system of equations :

$$10x - 2y - z - u = 3$$
$$-2x + 10y - z - u = 15$$
$$-x - y - 10z - 2u = 27$$
$$-x - y - 2z + 10u = -9.$$

Carry out 2 iterations.

(7 marks)

(b) Find a root of $3x - 1 = \cos x$, correct to three decimals using Newton-Raphson's method.

(5 marks)

Or

16. (a) Find a root of $x^3 - 5x - 11 = 0$ correct to three decimals using iteration method. (5 marks)

(b) Find the root that lies between 0 and 1 for the equation $x^3 - 5x + 1 = 0$, using the bisection method. Carry out 4 iteractions.

(7 marks)

Module 4

17. Using 4th order Runge-Kutta method with step length $h = 0.2$, solve the initial value problem $y' = xy, y(1) = 2$, and obtain $y(1.2)$.

(12 marks)

Or

18. With the usual assumptions, derive Milne's predictor and corrector formulas of order 4 to solve the initial value problem :

$y' = f(x, y), y(x_0) = y_0$.

(12 marks)

Module 5

19. Use dual simplex method to solve the L.P.P :

Minimize $z = 2x_1 + 3x_2 + 10x_3$

subject to $2x_1 - 5x_2 + 4x_3 \geq 30$

$3x_1 + 2x_2 - 5x_3 \geq 25$

$x_1 + 3x_2 + x_3 \leq 30$

$x_1, x_2, x_3 \geq 0.$

(12 marks)

Or

20. There are three factories F_1, F_2 and F_3 situated in different areas with supply capacities as 200, 400 and 350 units respectively. The items are shipped to five markets M_1, M_2, M_3, M_4 and M_5 with demands as 150, 120, 230,200, 250 units respectively. The cost matrix is given as follows :

	M_1	M_2	M_3	M_4	M_5
F_1	2	5	6	4	7
F_2	4	3	5	8	8
F_3	4	6	2	1	5

Determine the optimal shipping cost and shipping patterns.

(12 marks)

[5 × 12 = 60 marks]

F 6342 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Civil Engineering

CE 010 502—COMPUTER PROGRAMMING (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Write neat and efficient C programs whenever needed.

Part A

Answer **all** *questions briefly.*
Each question carries 3 *marks.*

1. Distinguish between global and local variables.
2. Give an example for exit controlled loop and explain.
3. Show, with an example, how do you declare a two-dimensional array ?
4. What is union ? How it is different from a structure ?
5. What are the three steps that are followed while accessing a file ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the use of break and switch with the help of example.
7. Show the various methods to call a function.
8. Show how do you pass arrays as function arguments.
9. Write a structure specification that includes four "float" variable called length, breadth, height and volume. Call this structure "box".
10. Describe two different methods to update a data file ? Which is better ? Why ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module I

11. (a) List and explain various format field specifications of scanf statements. Give examples and explain their meanings.

(6 marks)

(b) Write a C program, with adequate comments, to exchange the values of the variables X and Y, without using any temporary variable.

(6 marks)

Or

12. Describe, with suitable examples, all the operators in C ; specify their hierarchy operators.

Module II

13. What is recursion ? Explain with example, two types of parameter passing in functions.

Or

14. Write program with adequate comments to calculate ${}^{n}C_{r} = \frac{n!}{(n-r)!\,r!}$ and ${}^{n}P_{r} = \frac{n!}{(n-r)!}$ using functions.

Module III

15. Write a C program to do linear search of any *one* particular character on an array of elements. Display if found or not found, if found display its position also.

Or

16. Explain in detail, the different string related operations and the string handling functions with suitable example programs to demonstrate each of them.

Module IV

17. What is meant by dynamic memory allocation ? Explain with the help of examples the differences between malloc ( ), calloc ( ) and realloc ( ) in terms of the functions they perform.

Or

18. Explain in detail about the self referential structures and with the help of a program. Explain how the different types of linked lists are implemented ?

Module V

19. Write a C program, with adequate comments, that counts the number of times the first three letters of the alphabet (A, a, B, b, C, c) occur in a file. Do not distinguish between the lower case and upper case letters ?

Or

20. Write a C-program that will receive a file name and a line of test as command line arguments and write the test to the file.

(5 × 12 = 60 marks)

F 6373 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Civil Engineering

CE 010 505—QUANTITY SURVEYING AND VALUATION (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Assume any missing data suitably, and stated.

1. (a) For the building shown in Figure (on page : 4) work out the quantities of the following items of work :

(i) Earth work excavation in ordinary soil.

(ii) R.R. masonry in foundation and plinth wall.

(iii) Inside plastering in CM 1 : 4, 12 mm thick for walls.

(iv) R.C.C. for lintels and roof slab.

(4 × 10 = 40 marks)

Or

(b) Work out the following quantities for the same building :

(i) P.C.C. 1 : 4 : 8 for foundation.

(ii) First class brickwork masonry in CM 1 : 6 for superstructure.

(iii) Ceiling plastering in CM 1 : 3, 10 mm thick.

(iv) Mosaic flooring over C.C. bed (1 : 4 : 8) 40 mm thick excluding bath and W.C.

(4 × 10 = 40 marks)

2. Write detailed specifications for the following items of work :

(a) (i) Earthwork in excavation for foundation trenches.

(ii) Reinforced cement concrete 1 : 1½ : 3.

(iii) First class brick work in superstructure.

(iv) Snowcem washing.

(4 × 5 = 20 marks)

Or

Turn over

(b) (i) Painting on metal.

(ii) C.C. 1 : 4 : 8 below flooring

(iii) Plastering in CM 1 : 4.

(iv) Laterite work in CM 1 : 5 for superstructure.

(4 × 5 = 20 marks)

3. Work out the unit rates for the following items of work using local prevailing rates :

(a) (i) C.C. 1 : 4 : 8 with grade stone ballast 40 mm in foundation.

(ii) First class brick work in CM 1 : 4 in superstructure ground floor.

(2 × 10 = 20 marks)

Or

(b) (i) Mangalore tile roofing including battens.

(ii) Painting two coats (excluding primer coat) with ready mixed paint on new wood work.

(2 × 10 = 20 marks)

4. (a) (i) Explain the constant percentage method for c. Calculating depreciation. (2 marks)

(ii) A leasehold property is to produce a net annual income of Rs. 2,50,000 for the next 30 years. The owner expects a return of 9% on his capital and also sets apart a sinking fund instalment to accumulate at 6% annually to replace the capital. Determine the value of the property.

(8 marks)

Or

(b) (i) Explain the development method of valuation of property. (2 marks)

(ii) Write short notes on :

Market value and book value.

Free hold purchase,

Belting method of valuation,

Monopoly value and potential value,

Capitalised value.

(8 marks)

5. (a) A building having a plinth area of 450 m^2 is situated in a plot of area 1200 m^2. The future life of the building is estimated as 75 years. The gross rent from the building is Rs, 12,000 per month. Compute the capitalised value of the property on the basis of 7% net yield. 3% compound interest may be assumed, for sinking fund. Cost of the land may be taken as Rs. 4,000/m^2.

The outgoings are as under :

(i) Repair and maintenance –5% of gross income.

(ii) Taxes – 15% of gross rent.

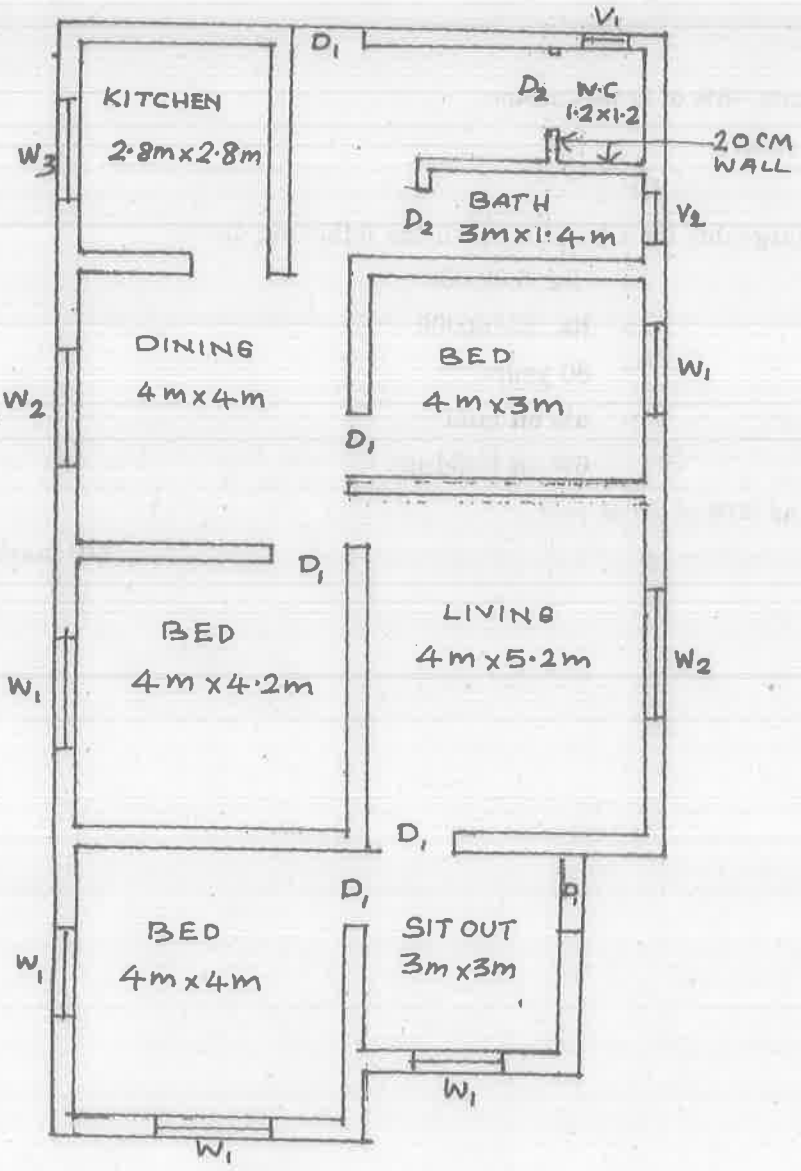
Or

(b) Estimate the annual rent chargeable for a building with the following data :

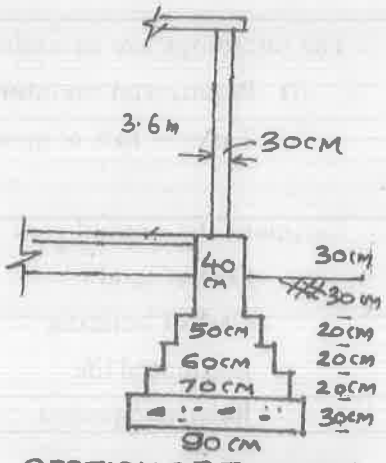
Cost of land	=	Rs. 8,00,000
Cost of building	=	Rs. 25,00,000
Estimated life	=	80 years
Return expected	=	5% on land
		6% on building

Outgoings may be assumed as 30% of gross rent.

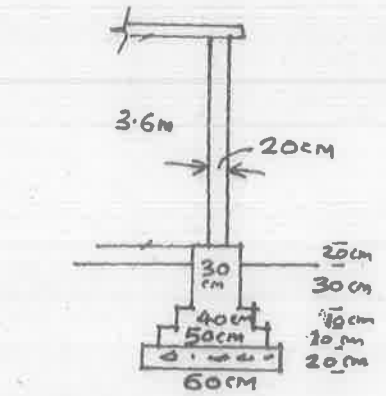
(10 marks)



PLAN



SECTION OF 30 CM WALL



SECTION OF 20 CM WALL

DOORS

D1 = 1·2m x 2·1m
D2 = 1m x 2·1m

WINDOWS

W1 = 1·5m x 1·35m
W2 = 2m x 1·35m
W3 = 1·5m x 0·75m

VENTILLATOR

V1 = 0·8m x 0·6m

LINTELS - 10 CM THICK R.C.C

F 6390 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Common to all branches except Computer Science and Engineering/ Information Technology

ENGINEERING MATHEMATICS–IV (CMELPASUF)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Answer any **one** *question from each module.*
All questions carry equal marks.

Module I

1. (a) State Cauchy's integral formula and integral theorem. Use it to evaluate $\int_C \frac{\cos \pi z}{z^2-1}$ where C is the rectangle with vertices $2 \pm i$, $-2 \pm i$.

(12 marks)

(b) Find the Laurent's series expansion of $\frac{1}{z-z^3}$ in $1 < |z+1| < 2$. (8 marks)

Or

2. (a) If $f(a) = \int_C \frac{4z^2+z+5}{z-a} dz$ where C is the ellipse $9x^2+4y^2=36$ find $f(3)$, $f'(1)$ and $f''(-1)$.

(10 marks)

(b) Find the Taylor's series expansion of $f(z) = \frac{2z^3+1}{z^2+1}$ at $z = i$ and $z = -i$. (10 marks)

Module II

3. (a) Using method of false position, find a root of the equation $x^3 - x - 4 = 0$ lying between 1 and 2 correct to four decimal places.

(10 marks)

(b) Find by Newton's method, the root of the equation $\log x = \cos x$. (10 marks)

Or

Turn over

4. (a) Apply Gauss-Seidel method to solve the equations :

$$10x - 2y + z = 12,$$
$$x + 9y - z = 10,$$
$$2x - y + 11z = 20.$$

(12 marks)

(b) Find a root of the equation $x^3 - x = 11$ which lies between 2 and 3, using bisection method.

(8 marks)

Module III

5. (a) Use Taylor's series method to find $y(0.1)$ and $y(0.3)$ correct to four decimal places, given that $\frac{dy}{dx} = y^2 - x$, $y(0) = 1$.

(10 marks)

(b) Using Milne's Predictor-Corrector method find $y(1.2)$ taking $h = 0.1$, given $\frac{dy}{dx} = xy - x^2$, $y(1) = 1$.

(10 marks)

Or

6. (a) Use Euler's modified method to compute $y(0.4)$, given that $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 3$ taking $h = 0.2$. correct to four decimal places.

(10 marks)

(b) Apply Runge-Kutta method order four to find an approximate value of y at $x = 0.1$ if $\frac{dy}{dx} = xy + y^2$ and $y(0) = 1$.

(10 marks)

Module IV

7. (a) Prove Shifting rules and hence show that $Z\left(\frac{1}{n!}\right) = e^{\frac{1}{z}}$.

(8 marks)

(b) Using Z-transform solve $6y_{n+2} - y_{n+1} - y_n = 0$ with $y(0) = y(1) = 1$.

(12 marks)

Or

8. (a) Solve $u_{n+2} - 2u_{n+1} + u_n = 2^n$ with $u_0 = 2, u_1 = 1$.

(12 marks)

(b) Find $Z^{-1}\left[\frac{2z}{(z-1)(z^2+1)}\right]$.

(8 marks)

Module V

9. (a) Using graphical method solve the following L.P.P.

Minimize $Z = 3x + 2y$

subject to the constraints,

$5x + y \geq 10$,

$x + y \geq 6$,

$x + 4y \geq 12$ with

$x, y \geq 0$.

(8 marks)

(b) How will you identify unbounded solution of an L.P.P. from its simplex table ? Using simplex algorithm, solve the following L.P.P.

Maximize $Z = 3x + 2y + 5z$

subject to the constraints,

$x + 2y + z \leq 430$,

$3x + 2z \leq 460$,

$x + 4z \leq 420$ with

$x, y, z \geq 0$.

(12 marks)

Or

10. (a) Use Big-M method to solve the following L.P.P. :

Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

subject to the constraints,

$x_1 + 2x_2 + 3x_3 = 15$,

$2x_1 + x_2 + 5x_3 = 20$,

$x_1 + 2x_2 + x_3 + x_4 = 10$ with

$x_1, x_2, x_3, x_4 \geq 0$.

(10 marks)

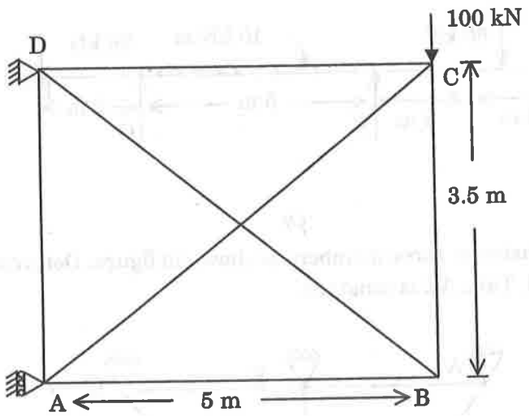
(b) The following table gives the cost matrix of transporting one unit of a product from the sources F, G and H to the destinations A, B and C. Compute the optimum allocations and minimum cost of transportation using MODI method.

	A	*B*	*C*	*Supply*
F	16	20	12	200
G	14	8	18	160
H	26	24	16	90
Demand	180	120	150	450

(10 marks)

[5 × 20 = 100 marks]

18. Find the member forces in the truss as shown in figure below by flexibility method. Take AE = constant. Treat the member AD as redundant.



19. Derive shape function for first order rectangular element.

Or

20. With sketches explain the significance of displacement models in finite element analysis.

(5 × 12 = 60 marks)

F 6383 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Civil Engineering

CE 010 506—STRUCTURAL ANALYSIS–I (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Explain the importance of Clapeyron's theorem of three moments.
2. Define Relative Stiffness.
3. Define structure stiffness matrix.
4. Explain significance of compatibility equation.
5. What are two types of Interpolation functions ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

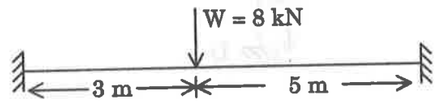
6. Explain static indeterminacy with sketches.
7. What are the important propositions in moment distribution method ?
8. Distinguish between analysis of beams and pin jointed frames in stiffness method.
9. Explain force transformation matrix with an example.
10. Explain geometric invariance.

(5 × 5 = 25 marks)

Part C

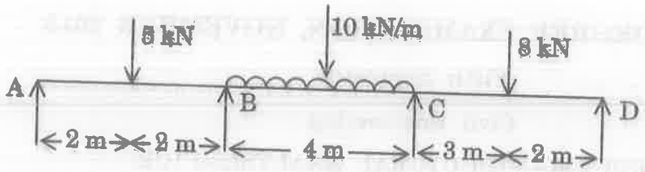
Each full question carries 12 *marks.*

11. Calculate the moments at the supports using method of consistent deformation



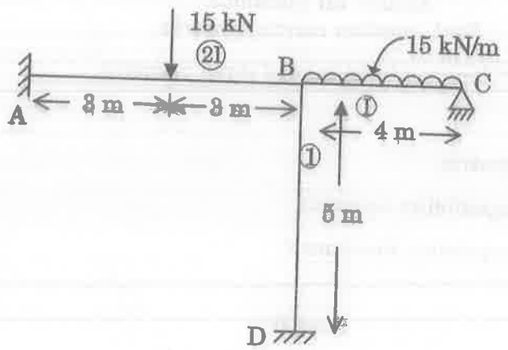
Or

12. Analyse the following beam using theorem of three moment.



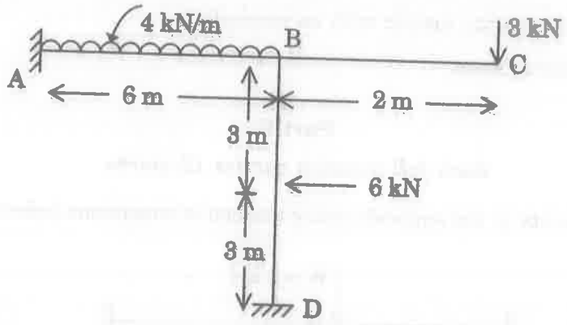
Find the B.M. and the reactions at the four supports.

13. Plot B.M.D. and deflected shape of the following structure using slope deflection method

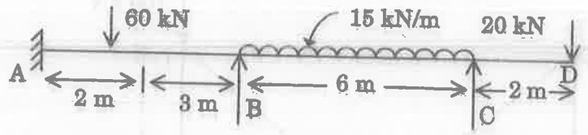


Or

14. Analyse the rigid frame shown in the figure by moment distribution method.

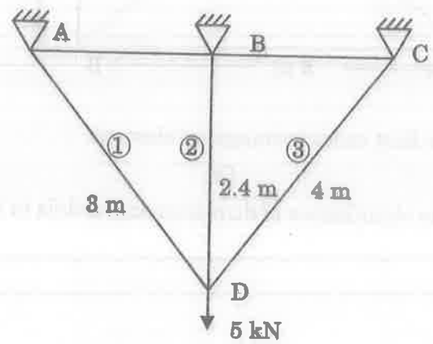


15. Analyse the beam shown by direct stiffness method. Take EI as constant.

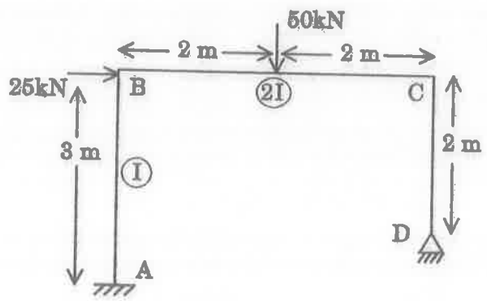


Or

16. A Pin jointed frame consists of three members as shown in figure. Determine the member forces by direct stiffness method. Take AE is constant.



17. Analyse the frame shown in figure by flexibility method. Take the reactions at D as redundant.



Or

20. (a) Explain different types of foundation settlement. (6 marks)

(b) Estimate the immediate settlement of a concrete footing 1 m × 2 m size, foundation at a depth of 1 m in soil with $E = 10^4$ kN/m^2, $\mu = 0.3$. The footing is subjected to a pressure of 200 kN/m^2. Assuming the footing to be rigid.

(6 marks)

[5 × 12 = 60 marks]

F 6361 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Civil Engineering

CE 010 504—GEOTECHNICAL ENGINEERING–I (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Graph / Semi log sheets to be supplied.

Missing Data if any, may be suitably assumed.

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Explain Plasticity Chart.
2. Define flownet diagram for Isotropic soils.
3. Explain significance of liquefaction.
4. Define zero air void line.
5. Define degree of consolidation.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Explain sand replacement method.
7. Explain quick sind condition in soil.
8. Explain sensitivity of soil.
9. What are the factors affecting compaction of soil ?
10. Define square root time method of consolidation analysis.

(5 × 5 = 25 marks)

Turn over

Part C

Each question carries 12 marks.

11. (a) Derive the relationships $\gamma_{sat} = \left(\frac{G+e}{1+e}\right) \cdot \gamma_w$ with usual notations. (6 marks)

(b) The following results were obtained from a soil test in laboratory :

(i) Percentage of soil passing 75 micron sieve = 35%

(ii) Percentage of coarse fraction passing 4.75 mm sieve = 55%.

(iii) Liquid Limit = 60% plastic Limit = 25%

(iv) Uniformity co-efficient = 6.5

(v) Co-efficient of curvature = 1.5

Classify the soil according to J.S. classification.

(6 marks)

Or

12. (a) Derive the relationship between void ratio, water content, specific gravity and degree of saturation.

(6 marks)

(b) A partially saturated soil sample obtained from on earth till has a natural moisture content of 26% and unit weight 19.74 kN/m^3. Assuming specific gravity of solids is 2.68, compute :

(i) degree of saturation.

(ii) void ratio.

(6 marks)

13. (a) Explain factors affecting permeability. (6 marks)

(b) Derive an expression for co-efficient of permeability in case of falling head permeability test.

(6 marks)

Or

14. (a) Explain Darcy's law of permeability. (6 marks)

(b) A horizontal stratified soil deposit consists of three layers, each uniform in itself. The permeability of the layers are 10×10^{-4}, 50×10^{-4}, and 20×10^{-4} cm/sec. and their thicknesses are 6 m, 3 m and 12 m respectively. Find the effective average permeability of the deposit in horizontal and vertical directions.

(6 marks)

15. (a) Describe direct shear test. What are its merits and demerits ? (6 marks)

(b) A sample of a soil failed in tri-axial test under a deviator stress of 200 kN/m^2 when the continuing pressure was 100 kN/m^2. If for the some sample, the confining pressure had been 200 kN/m^2, what would have been the deviator stress ? Assume the soil has :

(i) C = 0 and

(ii) $\phi = 0$.

(6 marks)

Or

16. (a) Explain Vanc shear test. (6 marks)

(b) A cylindrical soil sample failed at in axial load of 140 kN/m^2 in on unconfined compression test. The failure plane makes an angle of 54° with horizontal. Determine the soil properties.

(6 marks)

17. (a) Explain different methods of field compaction. (6 marks)

(b) Calculate the factor of safety with respect to cohesion of a clay slope laid at 1 in 1 to a height of 9 m if the angle of internal friction $\phi = 20°$, C = 30 kN/m^2 and r = 19 kN/m^3. What will be the critical height of the slope in this soil ?

Slope angle	30°	45°
Stability no.	0.0625	0.062

for $\phi = 20°$

(6 marks)

Or

18. (a) Explain different types of failures of soil slopes. (6 marks)

(b) The Maximum dry density of a sample by light compaction test is 1.76 gm/ml. at an Optimum water content of 15%. Find the air content and degree of saturation G = 2.67.

(6 marks)

19. (a) Differentiate between primary consolidation and secondary consolidation. (6 marks)

(b) A 15 m thick clay stratum over lies on impervious stratum. If co-efficient of consolidation is 5×10^{-4} cm^2/sec. Find time required for 50% and 90% consolidation.

(6 marks)

Or

F 6350 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Civil Engineering

CE 010 503—DESIGN OF CONCRETE STRUCTURES–I (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Missing data if any, may be suitably assumed and stated.
IS 456 *and SP* 16 *are allowed to be used.*

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Distinguish between under reinforced and over reinforced sections.
2. Define characteristic strength of material.
3. Why corner reinforcement is provided in rectangular slabs whose corners are prevented from lifting up ?
4. What are the functions of transverse reinforcement in a reinforced concrete column ?
5. Write down the method of estimating live load on a staircase.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. A doubly reinforced concrete beam has the following geometric and reinforcement details :

   Width of beam = 300 mm,

   Overall depth = 900 mm.

   Cover to reinforcement = 50 mm at top and bottom of beam.

   Ast = 1388 mm^2,

   Asc = 402 mm^2.

   M_{20} grade concrete and Fe 415 steel are used.

   Compute the moment of resistance of the section.

7. Determine from first principles, the area of tension steel for a singly reinforced concrete section having a width of 320 mm and an effective depth of 600 mm, to withstand a factored moment of 205 kN-m.

Turn over

8. A R.C. slab is continuous over five supports which are equally spaced at a distance of 3.1 m c/c. The slab carries a superimposed live load of 3 kN/m^2. Determine the maximum values of positive and negative bending moments.

9. With a neat sketch briefly explain the interaction diagram for design of short columns subjected to axial loading and uniaxial bending.

10. Explain single shear and double shear associated with the design of an independent R.C. footing.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. Design a doubly reinforced rectangular beam simply supported at both the ends to carry a service live load of 20 kN/m and superimposed dead load of 16 kN/m over a clear span of 6.20 m. The width and overall depth of the beam are limited to 360 mm and 600 mm respectively. Use M_{20} concrete and Fe 415 steel.

Or

12. A reinforced concrete rectangular beam section 300 mm × 600 mm (over all) is reinforced with 4 bars of 25 mm diameter at an effective cover of 50 mm on tension side. Assuming M_{25} grade concrete and Fe 415 HYSD bars determine the moment of resistance and the stresses in steel and concrete corresponding to this moment.

13. A simply supported beam of rectangular section spanning over 5 m has a width of 200 mm and an effective depth of 450 mm. The beam carries a live load of 15 kN/m and dead load of 25 kN/m. Design the reinforcements by limit state method. Also design the shear reinforcements. Adopt M_{20} concrete and Fe 415 steel.

Or

14. Find by limit state method the moment of resistance of a T–beam section, with the following details :

b_w = 300 mm, b_f = 1,600 mm, D_f = 100 mm and d = 510 mm. The reinforcement consists of 4 bars of 25 mm dia. Use M_{20} concrete and Fe 415 steel.

15. Design a continuous one-way slab for a building floor. The slab is continuous over beams spaced at 3.2 m intervals. The live load is estimated as 4.5 kN/m^2. Adopt M_{20} grade concrete and Fe 415 steel.

Or

16. The floor of a hall measures 15 m × 6 m to the faces of supporting walls. The floor consists of two beams spaced at 5 m c/c and the slab thickness is 120 mm. The slab carries a u.d.l. of 5 kN/m^2 inclusive of the floor finishes. Design the slab for the central panel of the hall. Use M_{20} concrete and Fe 415 steel.

17. Design a circular column to carry an axial load of 1200 kN using :

(a) Lateral ties.

(b) Helical reinforcement.

Use M_{20} concrete and Fe 415 steel.

Or

18. Determine the reinforcement for a column of a braced frame for the following data :

Size of the column 400 mm × 600 mm

P_u = 1800 kN

M_{ux} = 160 kNm

M_{uy} = 125 kNm.

Unsupported length of the column = 4 m.

Effective cover = 50 mm.

Use M_{20} concrete and Fe 415 steel.

19. Design an isolated unsymmetrical square footing for a column of size 500 mm × 500 mm, transmitting a load of 600 kN and a moment of 30 kNm. Safe bearing capacity of soil is 150 kN/m^2. Use M_{20} concrete and Fe 415 steel.

Or

20. Design a single flight straight staircase, with 12 risers each 160 mm and with the tread 300 mm and upper and lower landing of 1250 mm width each. The edge of the two landing are simply supported on two masonry walls, 230 mm thick. Design waist slab of the stair assuming M_{20} concrete and Fe 415 steel.

(5 × 12 = 60 marks)