Register Number :

Name of the Candidate :

0 2 2 6

B.E. DEGREE EXAMINATION, 2016

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-501 / CSEC-501 / MEEC-501 / PMEEC-401.

NUMERICAL METHODS

(Common with Civil and Structural, Mechanical and Part-Time)

May] [Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.

ALL questions carry EQUAL marks.

UNIT – I

1. (a) Solve the difference equation :

$$y_{n+1} - 2y_n \cos\alpha + y_{n-1} = 0. \quad (8)$$

(b) Prove that : $E \equiv 1 + \Delta$ (7)

(OR)

2. (a) Solve the difference equation :

$$y_{n+2} - 16y_n = \text{Cos}\frac{n}{2}. \quad (8)$$

(b) Prove that : $E\ \nabla = \nabla\ E = \Delta$. (7)

UNIT - II

3. (a) Interpolete by means of Gauss's backward formula the sales concern for the year 1966, given that : (7)

Year :	1931	1941	1951	1961	1971	1981
Sales (in lakhs of ₹)	12	15	20	27	39	52

(b) Given $\log_{10}654 = 2{\cdot}8156$, $\log_{10}658 = 2{\cdot}8182$, $\log_{10}659 = 2{\cdot}8189$ and $\log_{10}661 = 2{\cdot}8202$, find by divided difference formula the value of $\log_{10}656$. (8)

(OR)

4. (a) Using the following data, find f'(5) : (7)

x:	0	2	3	4	7	9
f(x);	4	26	58	112	466	922

(b) Apply Simpon's rule to evalaute $\int_0^2 \frac{dx}{1+x^3}$ to two decimal places, by dividing the range into four equal parts. (8)

UNIT - III

5. (a) Solve the following by Gauss-Seidel iteration method : (8)

$$28x + 4y - z = 32.$$
$$x + 3y + 10z = 24.$$
$$2x + 17y + 4z = 35.$$

(OR)

(b) Find by Newton-Raphson method, the real root of $3x - \cos x - 1 = 0$. (7)

6. (a) Obtain a root of the equation correct to three decimal places by using bisection method, $x^3 - x - 1 = 0$. (7)

(b) Solve by Gauss elimination method the equations : (8)

$$2x + y + 4z = 12.$$
$$8x - 3y + 2z = 20.$$
$$4x + 11y - z = 33.$$

UNIT - IV

7. (a) Use Taylor series solution to solve numerically $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$. Tabulate y for $x = 0{\cdot}1, 0{\cdot}2, 0{\cdot}3, 0{\cdot}4$. (7)

(b) Apply the fourth order Runge-Kutta method, to find an approxmiate value of y when $x = 0{\cdot}2$ given that $y' = x + y$, $y(0) = 1$. (8)

(OR)

8. (a) Given $\frac{dy}{dx} = \frac{\left(1+x^2\right)y^2}{2}$ and $y(0) = 1$, $y(0{\cdot}1) = 1{\cdot}06$, $y(0{\cdot}2) = 1{\cdot}12$, $y(0{\cdot}3) = 1{\cdot}21$, evaluate $y(0{\cdot}4)$ by Milne's predictor-corrector method. (8)

(b) Find the value of y for $x = 0{\cdot}1$ by Picard's method, given that

$$\frac{dy}{dx} = \frac{y - x}{y + x},\ y(0) = 1. \qquad (7)$$

9. Solve numerically $4\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ given that $u(0, t) = u(4, t)$; $u_t(x, 0) = 0$ and $u(x, 0) = x(4 - x)$ taking $h = 1$ and $k = \frac{1}{2}$. (15)

(OR)

10. Determine by iteration method the values at the interior lattice points of a square region of the harmonic function u whose boundary values are given as shown in figure-1 below : (15)

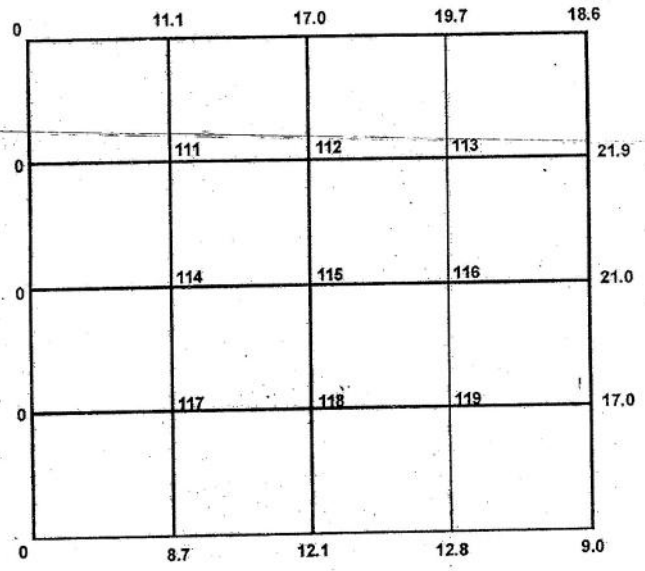

Figure-1.

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B.E. DEGREE EXAMINATION, 2016

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-502 / PCLEC-102. SURVEYING - II

(Common with Part-Time)

May]

[Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.
ALL questions carry EQUAL marks.

UNIT – I

1. (a) Explain the theory of stadia tacheometry. (7)

   (b) Describe the method of determining the constants of a tacheometer from field measurements. (8)

(OR)

2. A tacheometer was set up at a station C and the following readings were obtained on a staff vertically held. Calculate the horizontal distance CD and RL of D, when the constants of instrument are 100 and 0·15. (15)

Instrument station	Staff station	Vertical angle	Hair readings	Remarks
C	B.M	–5°20′	1·50, 1·800,2·450	R.L. of B.M.
C	D	+8°12′	0·750, 1·50, 2·250	= 750·50 m

UNIT - II

3. (a) List the elements of a simple curve. (5)

   (b) Describe the method of setting a circular curve by perpendicular effects from the tangent with the help of chain and tape. (10)

(OR)

4. Two tangents AB and BC intersect at B. Another line DE intersects AB and BC at D and E such that $\angle ADE = 150°$ and $\angle DEC = 140°$. The radius of the first curve is 200 m and that of the second is 300 m. The chainage of B is 950 m. Calculate all the necessary data for setting out the compound curve. (15)

UNIT - III

5. (a) What is base line? Give their use. (5)

   (b) Discuss in detail the points to be considered while selecting the site for base line. (10)

(OR)

6. (a) Triangulation networks for covering a large area are composed of any one or a combination of basic figures arranged as a series of chains or a connected centralized network. Enumerate any two such arrangements. (5)

   (b) Two stations P and Q are 81 km apart. They are situated on either side of a sea. The instrument axis at P is 39 m above MSL. The elevation of Q is 207 m above MSL. Calculate the minimum height of the signal at Q. The co-efficient of refraction is 0·08 and the mean radius of earth is 6370 km. (10)

UNIT - IV

7. The following are the mean values observed in the measurement of three angles $\angle A$, $\angle B$ and $\angle C$ at a station :

   $\angle A = 76^\circ\ 42'\ 46{\cdot}2''$ weight 4.

   $\angle A + \angle B = 134^\circ\ 36'\ 32{\cdot}6''$ weight 3.

   $\angle B + \angle C = 185^\circ\ 35'\ 24{\cdot}8''$ weight 2.

   $\angle A + \angle B + \angle C = 262^\circ\ 18'\ 10{\cdot}4''$ weight 1.

   Calculate the most probable value of each angle. (15)

(OR)

8. The following observations were made from station P :

A	=	34° 8′ 30″	weight 1.
B	=	30° 10′ 16″	weight 1.
A + B	=	64° 28′ 26″	weight 2.
A + B + C	=	111° 10′ 40″	weight 1.
B + C	=	70° 45′ 28″	weight 2.

   Find the most probable values of angles A, B and C. (15)

UNIT - V

9. Explain the solution of spherical triangle by trigonometric formula and Napier's rule. (15)

(OR)

10. Find the azimuth of the line QR from the following ex-meridian observations for azimuth.(15)

	Object	Face	Altitude	Level
			O	E
1	Q	L	--	--
2	SUN	L	5·4	4·6
3	SUN	R	5·2	4·8
4	R	R	--	--

	Horizontal Circle		Vertical Circle	
	A	B	C	D
1	30°12′20″	210°12′10″	--	--
2	112°20′30″	292°20′20″	24°30′20″	24°30′40″
3	293°40′40″	113°40′30″	25°00′00″	25°01′00″
4	211°50′30″	31°50′20″	--	--

Latitude of station Q = 36°48′30″N. Longitude of station Q = 4 h 12 m 32s E.

Declination of the sun at GMN = 01°32′16·8″ N decreasing at 56·2″ per hour.

Mean of LMT of two observations = 4 h 15 m 30^{S} P.M. by watch.

Watch running 4^{s} slow at noon, gaining $0{\cdot}8^{S}$ per day.

Value of level division = 15″.

Correction for horizontal parallax = 8·76″.

Correction for refraction = 57″ cot (apparent altitude). (15)

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B.E. DEGREE EXAMINATION, 2016

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-503 / PCLEC-105. STRUCUTURAL MECHANICS - I

(Common with Part-Time)

May] [Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.
ALL questions carry EQUAL marks.

UNIT – I

1. Determine the end moments in the beam as shown in figure-1 by using column analogy method. (15)

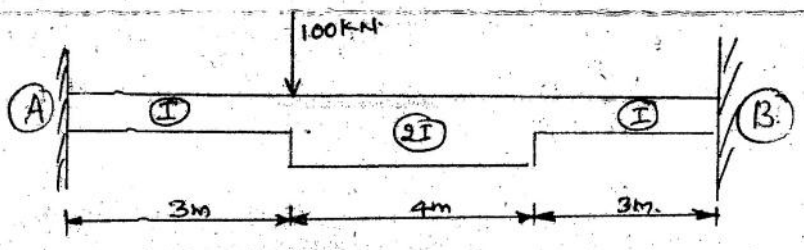

Figure-1

(OR)

2. Analyse the continuous beam ABCDE as shown in figure-2 and draw the bending moment and shear force diagrams. (15)

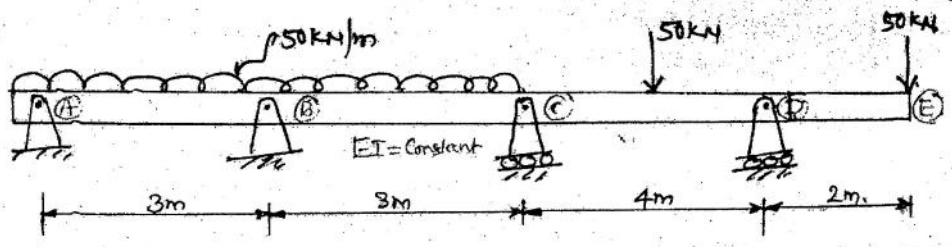

Figure-2

UNIT - II

3. Uniformly distributed load of intensity 30 kN /m crosses a simply supported beam of span 60 m from left to right. The length of *udl* is 15 m. Find the value of maximum bending moment for a section 20 m from left end. Also, find the absolute value of maximum bending moment and shear force in the beam. (15)

(OR)

4. Determine the maximum forces in the members 1, 2, 3 and 4 of the truss as shown in figure-3, when uniformly distributed load of 30 kN/m longer than the span traverses along the girder. (15)

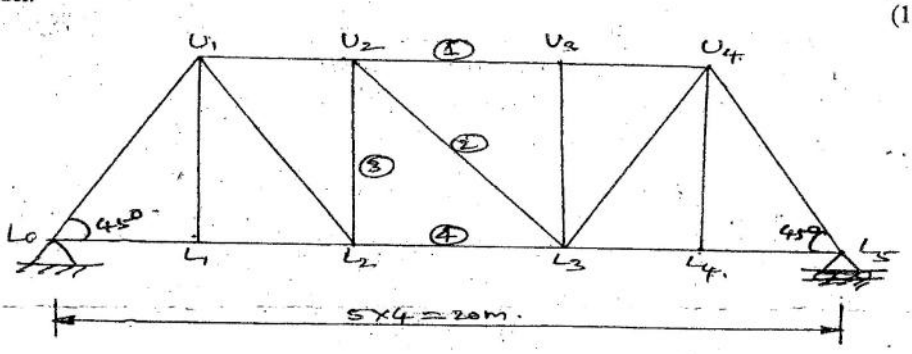

Figure-3

UNIT - III

5. A three hinged symmetric circular arch has a span of 36 m and a rise of 6 m. Determine the bending moment, normal thrust and radial shear at 9 m from the left support, if the arch is subjected to a uniformly distributed load of intensity 30 kN/m over left half portion and a concentrated load of 60 kN at 27 m from the left springing. (15)

(OR)

6. A three hinged symmetric parabolic arch of span 40 m and rise 5 m is subjected to rolling loads. Determine the maximum moment at a section 10 m from the left support due to
   (a) A concentrated load of 40 kN rolling from left to right.
   (b) A uniformly distributed load of intensity 20 kN/m longer than the span rolling from left to right. (15)

UNIT - IV

7. A suspension cable, 100 m span and 12 m dip is stiffened with a two hinged girder. The girder carries a dead load of 10 kN/m over entire span and a concentrated load of 800 kN at 40 m from left support. Determine the maximum tension in the cable and shear force and bending moment at a section 30 m left support. (15)

(OR)

8. A cable is suspended from two towers at 120 m apart. The supports are at the same level. The central dip is 10 m. Draw the influence line diagram for bending moment at the left quarter span section of the girder and find the maximum positive and negative bending moment at that section due to the passing of a concentrated load of intensity 50 kN on the girders (15)

UNIT - V

9. Analyse the continuous beam as shown in figure-4 by moment distribution method and draw the bending moment diagram. (15)

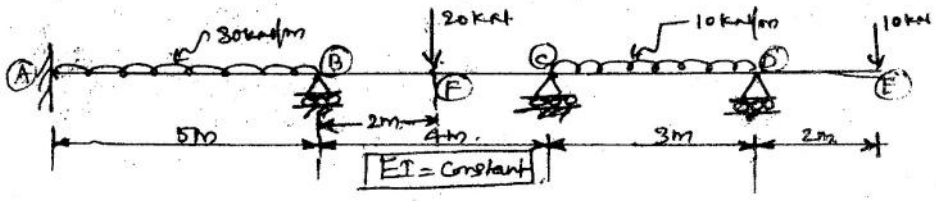

Figure-4

(OR)

10. Analyse the frame as shown in figure-5 by moment distribution method and draw the bending moment diagram. (15)

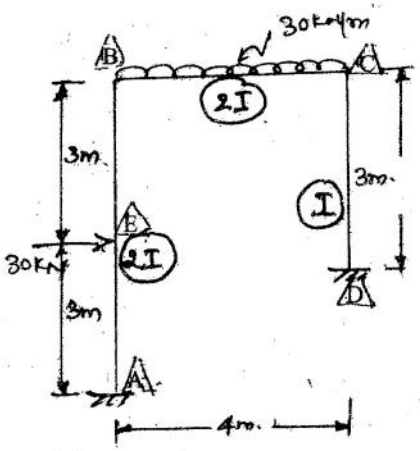

Figure-5

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B.E. DEGREE EXAMINATION, 2016

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-504 / PCLEC-302. SOIL MECHANICS

(Common with Part-Time)

May] [Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.

UNIT – I

1. Explain the classifications for soils for engineering purposes.

(OR)

2. A laboratory compaction test on soil having specific gravity equal to 2·68 gave a maximum dry density of 1·82 g/cm^3 and a water content of 17%. Determine the degree of saturation, air content and percentage of air voids at the maximum dry density. What would be theoretical maximum dry density corresponding to zero air voids at the optimum water content?

UNIT - II

3. Explain the classification of soil water.

(OR)

4. Calculate the co-efficient of permeability of a soil sample, 6 cm in height and 50 cm^2 in cross sectional area. If a quantity of water equal to 430 *ml* passed down in 10 minutes under an effective constant head of 40 *cm* on oven-drying, the test specimen has mass of 498 g Taking the specific gravity of soils solids as 2·65, calculate the seepage velocity of water during the test.

UNIT - III

5. A rectangular area 2 m × 4 m carries a uniform load of 80 kN/m^2 at the ground surface. Find the vertical pressures at 5 m below the centre and corner of the loaded area.

(OR)

6. An undistributed sample of clay, 24 mm thick, consolidated 50% in 20 minutes, when tested in the laboratory with drainage allowed at top and bottom. The clay layer, from which the sample was obtained is 4 m thick in the field. How much time will it take to consolidate 50%, with double drainage? If the clay stratum has only single drainage, calculate the time to consolidate 50%. Assume uniform distribution of consolidation pressure.

UNIT - IV

7. Explain Mohr-Coulomb failure thoery.

(OR)

8. A consolidated undrained triaxial test was conducted on a normally consolidated clay yielding the following data :

$$\sigma_3 = 250 \text{ kN/m}^2 ; \left(\Delta \sigma_d \right)_f = 275 \text{ kN/m}^2.$$

Determine the :

(a) The angle of friction.

(b) Angle which failure plane makes with the major principal plane and

(c) Normal stress and shear stress on the failure plane.

UNIT - V

9. A slope is 12 m high and has an inclination of 30°. If the soil of the slope has C= 25 kN/m^2, ϕ = 12° and γ = 18·6 kN/m^3, determine the factor of safety with respect to shear strength.

(OR)

10. Explain Bishop's method for the stability analysis of slope.

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B.E. DEGREE EXAMINATION, 2016

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC - 505 / PCLEC - 403. STRUCTURAL ENGINEERING - II

(Old Regulations)

May] [Time : 3 Hours

Maximum : 75 Marks.

(For the candidates of 2007-08 to 2009-10 only)

Answer any ONE FULL question from each unit.

Use of IS-456, SP-16 and STEEL TABLES ARE PERMITTED.

(assume any missing data suitably)

UNIT - I

1. A portal has a clear span of 8 m and clear height of 5 m above the base. It carries a UDL of 20 kN/m and a central point load of 20 kN. Design the portal, if it is fixed at base. Take SBC of soil as 150 kN/m^2. (15)

(OR)

2. Explain in detail the cantilever method for analyzing a frame to horizonal forces. (15)

UNIT - II

3. Design a stem of a cantilever retaining wall to retain an earth embankment 4m high above ground level. The density of earth is 18 N/m^3, and angle of repose is 30°, the embankment is horizontal at top. Adopt M-20 concrete and Fe-415 HYSD bars (15)

(OR)

4. Design the counter fort retaining wall for the following data. (15)

Height of the retaining wall above the ground level	: 6 m
SBC of soil	: 160kN/m^2,
Angle of friction	: 33°,
Density of soil	: 16kN/m^3,
Spacing of counter fort	: 3 m c/c

Use M-20 grade concrete and Fe-415 steel.

UNIT - III

5. Design a circular water tank with domical top for a capacity of 4 lakh litres. The depth of water is 4 m with a free board of 30 cm. The tank is supported on masonry tower and bottom of the tank consists of dome having a vertical rise of 2.0 m. Design the tank. (15)

(OR)

6. A reinforced concrete water tank resting on ground is 6 m × 2 m with a minimum depth of 2.5 m. Design the tank. Use M-20 grade concrete and Fe-415 steel. (15)

UNIT - IV

7. Explain with sketches different components of a reinforced concrete T beam bridge.(15)

(OR)

8. Design the superstructure for one span for a T beam bridge to be built on a rural section of a state highway. The bridge consists of five spans of 14 m. Assume moderate exposure. Use M-20 grade concrete and Fe-415 steel. Take IRC class AA tracked vehicle for a live load. (15)

UNIT - V

9. Design an angle section purlin for a trussed roof from the following data. (15)

   Span of the truss : 10 m

   Spacing of the truss : 4 m

   Spacing of purlin along the slope of the truss :2 m

   Slope of truss is 1 vertical and 2 horizontal. Wind load on purlin normal to roof is 10 N /m^2. Vertical load from roof covering is 0.2 kN/m^2.

(OR)

10. Open shed with roof span 16 m and rise 3.2 m with trussed spaced at 4 m apart is provided as a railway siding in the medium wind zone of 47 m/s. Design the purlins and roof truss, assuming adequate wind bracing. (15)

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B.E. DEGREE EXAMINATION, 2016

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC - 506. TRANSPORTATION ENGINEERING - II

May] [Time : 3 Hours

Maximum : 75 Marks.

Answer any ONE FULL questions from each unit.

UNIT - I

1. Compare the different types of ballast materials with respect to merits, demerits and suitability of each material an ballast. (15)

(OR)

2. Discuss the different types of rail sections used on Broad Gauge (BG) and metre Gauge (MG) tracks in India and state relative merits and demerits of each. (15)

UNIT - II

3. Discuss the various types of crossings in use on Indian Railways. (15)

(OR)

4. What are the various factors to be considered for efficient functioning of a marshallin yard? Discuss the types of marshalling yards. (15)

UNIT - III

5. (a) Write brief notes on tunnel surreying. (10)

   (b) Briefly describe about the vertilation in tunnels. (5)

(OR)

6. Write short notes on the followings: (15)

   (a) drilling in tunnel work (b) mucking operation

UNIT - IV

7. Explain with neat sketches the various types of barbours and the facilities provided in each of them. (15)

(OR)

8. Discuss the factors for barbours on: (15)

   (a) sandy coast (b) on the lower reach of river.

UNIT - V

9. What is Wet dock? Explain the various types of wet docks. (15)

(OR)

10. What is the significance of dredging? Explain the various types of dredgers. (15)