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B.E. DEGREE EXAMINATION, 2015

(CIVIL, CIVIL AND STRUCTURAL, MECHANICAL ENGINEERING)

(FIFTH SEMESTER)

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

May]

[Time : 3 Hours

Maximum : 75 Marks

(Maximum 60 Marks for those joined before 2011-12)

Answer any ONE FULL question from each unit.
Programmable calculators are not permitted.
ALL questions carry EQUAL marks.

UNIT – I

1. (a) If $u_x = x^3 + 3x^2 - 5x + 1$, find Δu_x, $\Delta^2 u_x$, $\Delta^3 u_x$, and $\Delta^{-1} u_x$. (7)

(b) Solve : $y_{n+2} - 5y_{n+1} + 3y_n = n\,2^n$. (8)

(OR)

2. (a) Prove that $\mu + \frac{1}{2}\delta = E^{\frac{1}{2}}$. (7)

(b) Solve : $y_{n+2} - 5y_{n+1} + 6y_n = 2^n + 1$. (8)

UNIT – II

3. (a) By means of Newton's divided differences formula, find f(8):. (7)

x :	4	5	7	10	11	13
f(x):	46	100	290	900	1200	2020

(OR)

(b) Compute the value of π by evaluating $\int_0^1 \frac{dx}{1+x^2}$, using Simpon's $\frac{1}{3}$ rule with 10 divisions. (8)

(OR)

4. (a) Fit a polynomial of least degree to fit the date by Lagrange's formula : (7)

x :	0	1	3	4
y :	–4	1	29	52

(b) Obtain y(3·75) from (8)

x:	2·5	3·0	3·5	4·0	4·5	5·0
y:	23·14	22·04	20·22	18·64	17·26	16·04

UNIT – III

5. (a) Solve by Crout's method, the following :

$x + y + z = 3.$

$2x - y + 3z = 16.$

$3x + y - z = -3.$ (7)

(b) Use Newton's Raphson method to find the roots of the following equation

$e^x = 2x + 21.$ (8)

(OR)

6. (a) By Gauss elimination, find A^{-1} if $A = \begin{bmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{bmatrix}$. (7)

(b) Find the positive root of the equation $xe^x - \cos x = 0$ correct to four decimal places by Regula Falsi method. (8)

UNIT - IV

7. (a) Using Runge-Kutta method of fourth order, solve

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$$

given $y(0) = 1$ at $x = 0{\cdot}2$ by taking $h = 0{\cdot}2$. (7)

(b) Using Taylor's series method, find y when $x = 1{\cdot}1$ and $x = 1{\cdot}2$ from

$\frac{dy}{dx} = x y^{\frac{1}{3}}$, $y(1) = 1$ (four decimal places). (8)

(OR)

8. (a) Given : $y' = \frac{\left(1 + x^2\right) y^2}{2}$,

$y(0) = 1$, $y(0{\cdot}1) = 1{\cdot}06$, $y(0{\cdot}2) = 1{\cdot}12$, $y(0{\cdot}3) = 1{\cdot}21$, calculate $y(0{\cdot}4)$ by Milne's predictor corrector method. (9)

(b) Find $y(1{\cdot}1)$ using Euler's method, satisfying $10y' = x^2 + y^2$, $y(0) = 1$. (6)

UNIT - V

9. (a) Solve the Poisson equation $U_{xx} + U_{yy} = -81xy$, $0 < x < 1$, $0 < y < 1$ given that $u(0,y) = 0$, $u(x,0) = 0$, $u(1, y) = 100$, $u(x, 1) = 100$ and $h = \frac{1}{3}$.

(7)

(b) Solve : $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5$, $t > 0$ given that $u(x, 0) = 20$, $u(0, t) = 0$, $u(5, t) = 100$. Compute u for one five step with $h = 1$ by Crank-Nicholson method. (8)

(OR)

10. (a) Solve : $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 y}{\partial y^2} = 0$

subject to

(i) $u(0, y) = 0$, for $0 \leq y \leq 4$.

(ii) $u(4, y) = 12 + y$, for $0 \leq y \leq 4$.

(iii) $u(x, 0) = 3x$, for $0 \leq x \leq 4$.

(iii) $u(x, 4) = x^2$, for $0 \leq x \leq 4$.

by dividing square into 16 square meshes. (10)

(b) Derive Boeder-Schmidt formula for one dimensional heat equations. (5)

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B.E. DEGREE EXAMINATION, 2015

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-502 / PCLEC-102. SURVEYING - II

May] [Time : 3 Hours

Maximum : 75 Marks

(Maximum 60 Marks for those joined before 2011-12)

Answer any ONE FULL question from each unit.

ALL questions carry EQUAL marks.

UNIT – I

1. A tacheometer was set up at station A and the following readings were obtained on a vertically held staff :

Inst.Station	Staff station.	Vertical angle	Stadia hair readings	Remarks
A	B.M	– 02° 18′	3·225, 3·550, 3·875	RL of BM
A	B	+ 08° 36′	1·650, 2·515, 3·380	= 425·515 m

Find the distance between A and B, R.L. of B. (15)

(OR)

2. A theodolite is fitted with stadia hairs, the object glass of telescope being known to have a focal length of 230 mm and at a distance of 138 mm from the trunnion axis. The multiplying constant is 180. The following tacheometric readings are taken from an instrument station A, the reduced level of which is 15·05 m.

Inst.at	Height of instrument	Sight to	Vertical angle	Stadia readings	Remarks
A	1·380	B	+ 30°	1·225, 1·422, 1·620	Staff held vertical. R.L of B = 40·940 m
A	1·380	C	+ 45°	1·032, 1·181, 1·330	Staff held normal to the line of sight,

Find the distance AB, AC and the R.L. of C. (15)

UNIT – II

3. Describe the method for setting out a simple curve. (15)

(OR)

4. Explain briefly the setting out of a compound curve by deflection angles. (15)

UNIT – III

5. (a) Classify the systems of triangulation. (7)

   (b) List the factors to be considered for site selection for base line. (8)

(OR)

6. (a) Explain the different types of signals used in triangulation. (10)

   (b) List the corrections that may be necessary when measuring the length of a base line (5)

UNIT – IV

7. Explain the procedure of measuring horizontal angle by repetition and reiteration methods. (15)

(OR)

8. (a) List the laws of weights. (9)

   (b) Define the terms :

   (i) Weight of an observation. (ii) Observed value of a quantity and

   (iii) Most probable value of a quantity. (6)

UNIT – V

9. (a) Enumerate the properties of a spherical triangle. (7)

   (b) Briefly discuss the elements of spherical triangle. (8)

(OR)

10. (a) The mean observed altitude of the Sun, corrected for refraction, parallax and level was $36°14' 16{\cdot}8''$ at a place in latitude $36°40' 30''$ N and longitude $56° 24' 12''$ E. The mean watch time of observation was $15^h 49^m 12{\cdot}6^s$, the watch being known to be about 3^m fast on LMT. Find the watch error given the following :

    Declination of Sun at the instant of observation = $+ 17° 26' 42{\cdot}1''$.

    GMT of GAN = $11^h 56^m 22{\cdot}8^s$. (10)

   (b) Write a short note on the determination of latitude and longitude. (5)

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B.E. DEGREE EXAMINATION, 2015

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

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

May]

[Time : 3 Hours

Maximum : 75 Marks

(Maximum 60 Marks for those joined before 2011-12)

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

UNIT – I

1. A beam AB of span L is fixed at A and B, and carries a point load "W" at a distance 'a' from A and 'b' from B. Calculate the support moments by using column analogy method.

(OR)

2. A beam ABCD, 16 m long is continuous over three spans AB= 6 m, BC = 5 m and CD = 5m, if the support B sinks by 5 mm, There is a uniformly distributed load of 20 kN/m over BC. On AB, there is a point load of 80 kN at 2 m from A. On CD, there is a point load of 60 kN at 3 m from D. Calculate the moments and reactions at the supports. Take $E = 2{\cdot}1 \times 10^5$ N/mm^2 and I = 9300 cm^4.

UNIT – II

3. Determine the influence line for the shear force at D, the middle point of span BC, of a continuous beam, shown in figure-1. Compute the ordinates at 1 m interval. EI constant.

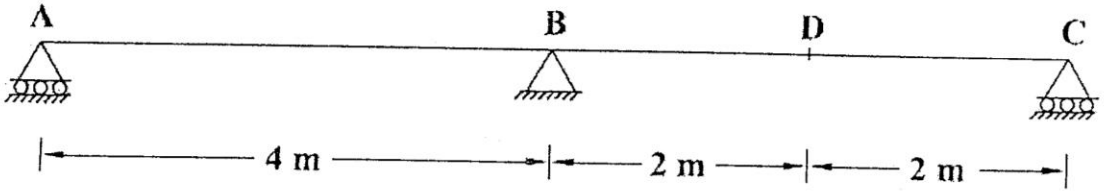

Figure -1

(OR)

4. For the span shown in figure-2, obtain the bending moment a section 'P', 20 m from left support due to given loads in the position indicated. Determine the maximum bending moment at a section 5 m from the left support. Also, find the magnitude of the absolute maximum bending moment anywhere in the girder.

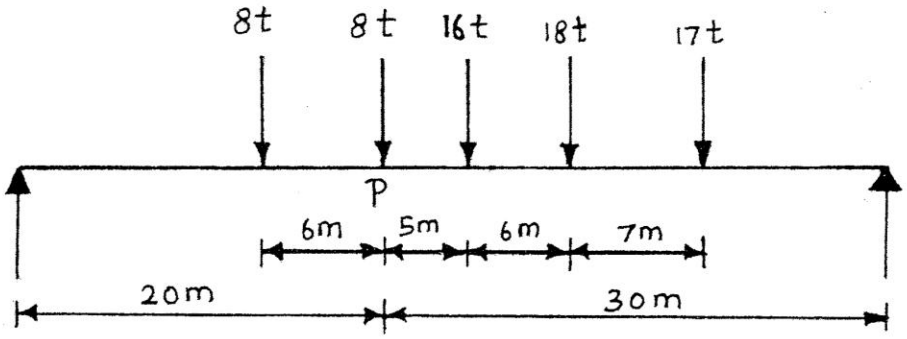

Figure-2

UNIT – III

5. A three hinged parabolic arch of span 20 m and rise 8 m carries a UDL of 40 kN/m over the left half span.
   (a) Analyse the arch and draw the BMD.
   (b) Also, evaluate the thrust and shear force at a section 8 m from left hinge.

(OR)

6. A circular arch rib 24 m span with a central rise of 4·8 m is hinged at the crown and the springings which are at the same level. It carries a point load of 100 kN at 6m from left end. Calculate :
   (a) The horizontal thrust at the ends. (b) The reactions at the support and
   (c) Maximum positive and negative bending moment.

   Also, draw the BMD.

UNIT – IV

7. A suspension cable is supported at two points 'P' and 'Q', 'P' being one metre above 'Q'. The distance PQ being 20 m. The cable is subjected to four loads of 2 KN, 4 kN, 5 kN and 3 kN at distances 4 m, 8 m, 12 m and 16 m respectively from 'P'. Find the maximum tension in the cable, if the dip of the cable at point of application of first load is 1 m with respect to level at P. Find also, the length of the cable.

(OR)

8. Derive from principle of the bending moment diagram for symmetrical suspension bridge with three hinged stiffening girder of length 'L' subjected to a point load 'W' at a distance 'x' from the central hinge. Draw to scale the bending moment diagram under the load.

UNIT – V

9. A continuous beam ABCD consists of three span, and is loaded as shown in figure-3, the ends A and B are fixed. Determine the bending moments at the supports and plot the bending moment diagram. Use moment distribution method.

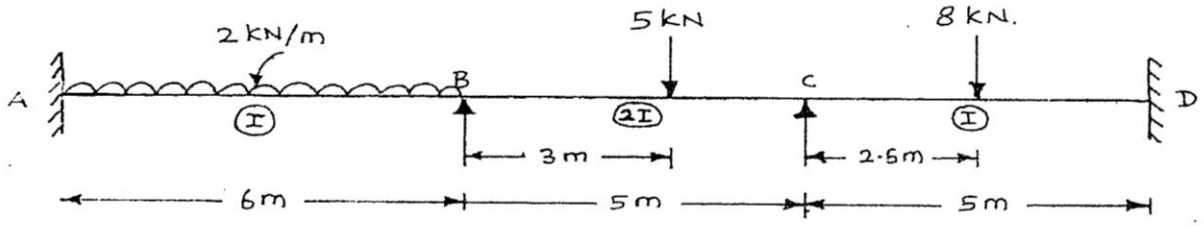

Figure -3

(OR)

10. Analyse the frame shown in figure-4 by moment distribution method and draw BMD.

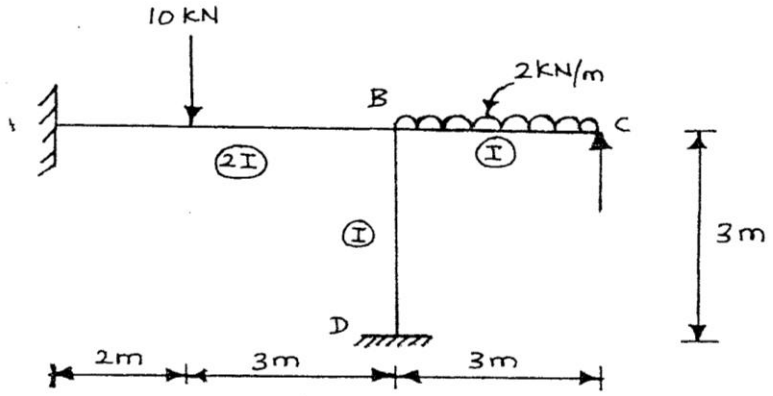

Figure -4

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B.E. DEGREE EXAMINATION, 2015

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-504 / PCLEC-302. SOIL MECHANICS

May] [Time : 3 Hours

Maximum : 75 Marks

(Maximum 60 Marks for those joined before 2011-12)

Answer any ONE FULL question from each unit.

ALL questions carry EQUAL marks.

UNIT – I

1. In a compression test on a soil, the mass of wet soil when compacted in the mould was 20 N. The water content of the soil was 16%. If the volume of the mould was 0·945 litres, determine the dry density, void ratio, degree of saturation and % air voids. Take G = 2·88. (15)

(OR)

2. Discuss various methods available for field compaction. (15)

UNIT – II

3. In a falling head permeability test, the initial head is 40 cm. The head drops by 5 cm in 10 minutes. Calculate the time required to run the test for the final head to be at 20 cm.If the sample is 6 cm height and 50 cm^2 in cross-sectional area, calculate the co-efficient of permeability. Take area of stand pipe is 0·5 cm^2. (15)

(OR)

4. Derive the equation to determine the value of permeability co-efficient 'k' from a falling head permeability method. (15)

UNIT – III

5. Explain briefly the construction of Newmark Chart. (15)

(OR)

6. A circular area of 7·5 m in diameter on the ground surface carries a uniformly distributed load of 3 kN/m^2. Find the intensity of vertical pressure below the centre of the loaded area at a depth of 6 metres below the ground surface. Use Boussinesg analysis. (15)

UNIT – IV

7. Explain the direct shear test in detail. (15)

(OR)

8. The stress on a failure plane in a drained test on a cohesionless soil are as under :

   Normal stress = 100 kN/m^2. Shear stress = 40 kN/m^2.

   (a) Determine the angle of shearing resistance and the angle which the failure plane makes with the major principal plane.

   (b) Find the major and minor principal stresses. (15)

UNIT – V

9. Describe modified Bishop's method for the stability analysis of slope and state its limitations. (15)

(OR)

10. A cohesive soil has unit weight of 19·2 kN/m^3, unit cohesion as 12 kN/m^2 and angle of internal friction as 10°. Calculate the critical height of vertical excavation that can be made without any lateral support. (15)

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B.E. DEGREE EXAMINATION, 2015

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-505. STRUCTURAL ENGINEERING - II

May] [Time : 3 Hours

Maximum : 75 Marks

(Maximum 60 Marks for those joined before 2011-12)

Answer any ONE FULL question from each unit.

Use of IS 456-2000, IS 800-2007, IS 875 Part-3 IRC are permitted.

ALL questions carry EQUAL marks.

UNIT – I

1. The substitute frame of a multistoreyed building having 3 bays has a continous beam ABCD with AB = 4·0m, BC = 2·5 m and CD = 4·0 m. The beams are spaced at 3 m intervals.

   Thickness for floor slab = 120 mm. Live load (office floor) = 4·0 kN/m^2.

   Floor finishes = 0·6 kN/m^2. Size of beams = 250 mm by 400 mm.

   Size of columns = 250 × 400 mm. Height between floors = 4m.

   Analyse the substitute frame and estimate the maximum design moments in the beams and columns. (15)

(OR)

2. A four storeyed multistorey building frame has four equal bays of 4 m each and the height between floors is 4 m. The wind loads acting at roof level and various floor levels are

   H_1 = 5kN, H_2 = 10 kN, H_3 = 10 kN and H_4 = 10 kN.

   The columns have the same cross section. Estimate the moments in the columns and beams using portal method. (15)

UNIT – II

3. Design a cantilever retaining wall to retain horizontal earthern embankment of height 4 m above the ground level. The earthern backfill is having a density of 18 kN/m^3 and angle of internal friction as 30°. The safe bearing capacity of the soil is 180 kN/m^3. The co-efficient of friction between the soil and concrete is assumed to be 0·45.Use M-20 concrete and Fe-415 steel. (15)

(OR)

4. Design a counterfort retaining wall to retain 4m earth above ground level. The top of the earth is to be level. The density of earth is 15 kN/m^3. The angle of internal friction of soil is 30°. The safe bearing capacity of soil is 200 kN/m^3 and the co-efficient of friction between soil and wall is 0·6. (15)

UNIT – III

5. Design a circular water tank of capacity 1,30,000 litres of total height 3 m. The tank is resting on the ground and the joint between the tank wall and base slab is flexible. Use M-30 concrete and Fe-415 steel. (15)

(OR)

6. Design the dome of an Intz tank for a capacity of 1000 kl. supported on symmetrically placed eight columns. Use M-30 concrete and Fe-415 steel. (15)

UNIT – IV

7. A reinforced concrete box culvert is required for a national highway crossing. The clear vent way of the box culvert is 4 m by 4 m. Design the box culvert assuming a super imposed dead load of 12 kN/m^2 and a live load of 50 kN/m^2. The density of the soil is 16 kN/m^3. Angle of repose is 30°. Adopt M-20 grade concrete and Fe-415 grade for steel. (15)

(OR)

8. A road bridge deck consists of a reinforced concrete slab continuous over the beams spaced at 2 m.centres and cross girders spaced at 5 m centres. Thickness of the wearing coat is 100 mm. Type of loading - IRC class-A. Adopt M-20 grade concrete and Fe-415 grade for steel. Design the deck slab and sketch the details of reinforcements. (15)

UNIT – V

9. A power plant structure having maximum dimension more than 50 m is proposed to be built on downhill side near Lakshadweep.The height of the hill is 300 m, with a slope of 1 : 3. If the location is 250 m form the crest of the hill on downward slope and its eave's board is at a height of 9 m, determine the design wind pressure. (15)

(OR)

10. Design a channel section purlin for the following data :

    (a) Spacing of trusses = 4m. (b) Spacing of purlins = 2 m.

    (c) Live load on galvanized iron roofing sheets = 0·6 kN/m^2.

    (d) Wind load = 1·5 kN/m^2. (e) Slope of main rafter = 30°. (15)

B.E. DEGREE EXAMINATION, 2015

(CIVIL ENGINEERING)

(FIFTH SEMESTER)

CLEC-506. TRANSPORTATION ENGINEERING - II

May] [Time : 3 Hours

Maximum : 75 Marks

(Maximum 60 Marks for those joined before 2011-12)

Answer any ONE FULL question from each unit.

ALL questions carry EQUAL marks.

UNIT – I

1. Compare the important characteristics of differrent types of sleepers used in Indian Railways. (15)

(OR)

2. Discuss the various maintenance practices followed on a permanent way. (15)

UNIT – II

3. Draw the neat sketch of a left hand turnout indicating all the components. Explain the function of each of them. (15)

(OR)

4. Explain the various types of track junction with neat sketches. (15)

UNIT – III

5. Briefly explain the various tunneling methods in soft strata and hard rock. (15)

(OR)

6. Write a brief note on the following :

   (a) Caissons in tunneling. (b) Tunnel drainage.

   (c) Lighting in tunnels. (8+3½+3½)

UNIT – IV

7. (a) What are the requirements of a good harbour? (5)

   (b) Explain the classification of harbours based on utility. (10)

(OR)

8. Explain with neat sketches, the various methods of construction in harbour. (15)

UNIT – V

9. What is dry dock? Explain the various types of dry dock. (15)

(OR)

10. What is the main function of a jetty? Explain the different types of jetties with a neat sketch. (15)