

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE301

Course Name: DESIGN OF CONCRETE STRUCTURES I

Max. Marks: 100

Duration: 3 Hours

- INSTRUCTIONS:** 1. Use of **IS 456:2000** is permitted
2. Furnish reinforcement **detailing** of sections designed

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) A rectangular beam 250mm wide and effective depth 450 mm has 4 bars of 20mm diameter. Find the moment of resistance of the section if M20 concrete and Fe 415 grade steel are used. As per IS 456:2000 find the limiting moment of resistance also. (10)
- b) Explain how the longitudinal reinforcement bent up nearer to the supports contribute to the shear resistance of RC beams? (5)
- 2 a) Explain the terms Characteristic strength and Characteristic load. (5)
- b) A 250 mm wide RC beam with 450mm depth is reinforced with 4 numbers 16 mm diameter bars of Fe 415 grade steel. Effective cover to reinforcement is 50mm. The beam is provided with 8 mm diameter 2 legged vertical stirrups at 160 mm/c as shear reinforcement. M20 concrete is used. Determine the design strength in shear and also its limiting value. (10)
- 3 a) Design the shear reinforcement for a simply supported RC beam of effective span 5m with width 300mm and effective depth 400mm and carrying a superimposed load of 10 kN/m. The beam is reinforced with 3 bars of 20 mm diameter. Use M20 concrete and Fe 415 grade steel. (10)
- b) Why does the code impose minimum and maximum limits with regard to (i) spacing and (ii) percentage area of flexural reinforcement? (5)

PART B

Answer any two full questions, each carries 15 marks.

- 4 Design a simply supported beam of span 6m subjected to a live load of 4 kN/m. Use M20 concrete and Fe415 steel. (15)
- 5 a) Design a cantilever slab of span 2m to carry imposed load of 2 kN/m² over its entire span. Finish load=0.5 kN/m². Use M20 concrete and Fe415 steel. The slab is supported by a beam of size 300mmx500mm. (12)

- b) Is it correct to model the interior beams in a continuous beam supported slab system as T beams to determine their flexural strength at all sections? (3)
- 6 a) Determine the longitudinal reinforcement required for a rectangular beam section with $b=300$ mm, $d=550$ mm, $M_u=100$ kNm, $T_u=45$ kNm, $V_u=80$ kN. Adopt M20 concrete and Fe 415 steel. (8)
- b) Differentiate between one way slabs and two way slabs. (4)
- c) Draw the reinforcement detailing of a simply supported one way slab (3)

PART C

Answer any two full questions, each carries 20 marks.

- 7 Design an interior panel of a continuous slab system with effective dimensions $4\text{m} \times 5\text{m}$ subjected to a live load of 3 kN/m^2 . Use M20 concrete and Fe 415 steel. (20)
- 8 Design a reinforced concrete column to carry an axial load of 1600 kN. Use M20 concrete and Fe415 steel. The column has unsupported length of 3m and is effectively held in position at both the ends, but not restrained against rotation. (20)
- 9 a) Differentiate between short term and long term deflections of RC beams (6)
- b) Determine the area of longitudinal steel to be provided in a short column of size $600\text{mm} \times 600\text{mm}$ subjected to a factored load of 1500 kN. Use M20 concrete and Fe415 steel. (9)
- c) Sketch the reinforcement detailing of a tread-riser type stair. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE301
Course Name: DESIGN OF CONCRETE STRUCTURES I
Use of IS 456:2000 is permitted

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Distinguish between balanced, over-reinforced and under-reinforced sections in limit state design. Which of these should be recommended in design? (5)
- b) Find the moment of resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 4 bars of 16 mm diameter of Fe415 steel. Take M20 concrete. Redesign the beam if necessary. (10)
- 2 a) With neat sketch explain the stress block parameters used in the design of singly reinforced concrete beam as per limit state method. (5)
- b) Design the shear reinforcement for a beam with $b= 350$ mm, $d= 550$ mm, $V_u= 125$ kN, $f_{ck}= 25$ N/mm², $f_y= 415$ N/mm². Percentage of steel is 1.67 percent. (10)
- 3 a) A simply supported beam, 300 mm wide and 600 mm effective depth carries a uniformly distributed load of 74 kN/m including its own weight over an effective span of 6 m. The reinforcement consists of 5 bars of 25 mm diameter. Out of these, two bars can be safely bent up at 1 m distance from the support. Design shear reinforcement for the beam. (10)
- b) Define development length and derive an expression for development length. (5)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) What are the situations that demand double reinforcement in beams? Compare the stress strain distributions in singly reinforced and doubly reinforced beams. (5)
- b) Determine the moment of resistance of beam having width b of 350 mm, depth of 900 mm with a cover of 50 mm. Beam is reinforced with 5 tension reinforcements of 20 mm HYSD bars (Fe 415) and 2 compression reinforcements of 20 mm Fe 415 steel. Grade of concrete is M15. (10)

- 5 Design a simply supported RCC slab for a roof of a hall $4\text{ m} \times 10\text{ m}$ (inside dimensions) with 230 mm walls all around. Assume a live load of 4 kN/m^2 and finish 1 kN/m^2 . Use M 25 concrete and Fe 415 steel. (15)
- 6 a) Differentiate between one way slab and two way slab. (5)
- b) A T-beam has the following data: width of flange= 750 mm, Breadth of beam= 250 mm, Effective depth= 500 mm, Thickness of flange= 90 mm. Determine the limiting moment of resistance of the beam. Use M20 concrete and Fe415 steel. (10)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Design a reinforced concrete slab $6.3 \times 4.5\text{ m}$ simply supported on all the four sides. It has to carry a characteristic live load of 10 kN/m^2 in addition to its dead weight. Assume M25 concrete and Fe 415 steel; also assume mild exposure conditions. (15)
- b) Explain the procedure for estimation of flexural crack width in reinforced concrete members as per IS456. (5)
- 8 a) Design and detail a dog-legged stair for a building in which the vertical distance between the floors is 3.6 m. The stair hall measures $2.5\text{ m} \times 5\text{ m}$. The live load may be taken as 2500 N/m^2 . Assume that stair is supported at outer edges. Use M20 concrete and Fe415 steel. (15)
- b) Sketch typical reinforcement detail in tread-riser type stairs. (5)
- 9 a) Design a circular short column to carry an axial load of 1000 kN using helical reinforcement. Use M20 concrete and Fe 415 steel. (12)
- b) How does one (a) check for deflections of two way slabs, and (b) control crack width in two way slabs? (8)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE303

Course Name: STRUCTURAL ANALYSIS -11

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Derive the equation for Clapeyron's three moment theorem considering unequal settlement of supports, different span lengths and different moment of inertia for adjacent spans. (10)
- b) Brief the sway analysis procedure for analysis of portal frames using slope deflection method. (5)
- 2 The ends A and C of a two-span continuous beam ABC are fixed and B is provided with roller support. Span AB is 4m long and carries a UDL of 15kN/m. BC has a span of 2m and carries a concentrated load of 80kN at 1.5m from the fixed end C. Analyse the beam ABC by the theorem of three moments and plot the BMD and SFD. Assume EI constant. (15)
- 3 a) Set up the slope deflection equations for a beam considering support settlement. (3)
- b) Using the slope deflection method, determine the moments at supports for the beam shown in Fig. 1 if the support B sinks by 10mm. Given $I=1.32 \times 10^8 \text{ mm}^4$ and $E=2 \times 10^5 \text{ N/mm}^2$. (12)

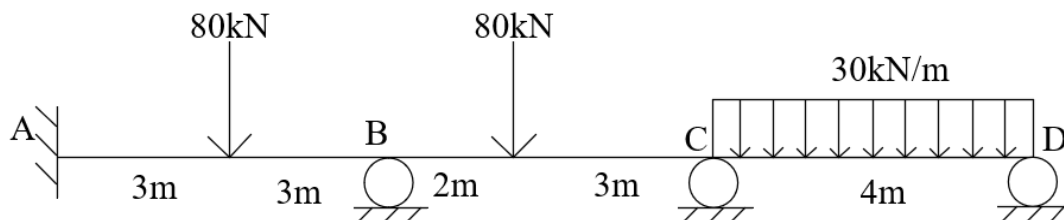


Fig. 1

PART B

Answer any two full questions, each carries 15 marks.

- 4 Analyse the rigid frame ABCD by moment distribution method. Ends A and D are fixed. AB and CD are vertical members with moment of inertia I and length 4m . The horizontal member BC with moment of inertia $2I$ is 6m long and acted upon by a concentrated load of 100kN at 2m from B. (15)
- 5 Analyse the three-span continuous beam ABCD by Kani's method and draw BMD and SFD. Left end support A is fixed and all other supports are roller supports. Span $AB=6\text{m}$, $BC=5\text{m}$ and $CD=4\text{m}$. Span AB carries a central concentrated load of 80kN , BC carries a concentrated load of 80 kN at 2m from B and CD carries a UDL of 30kN/m . EI is constant. (15)
- 6 a) Determine the moments at A, B, C of frame shown in Fig. 2 using Kani's method and plot BMD. (7)

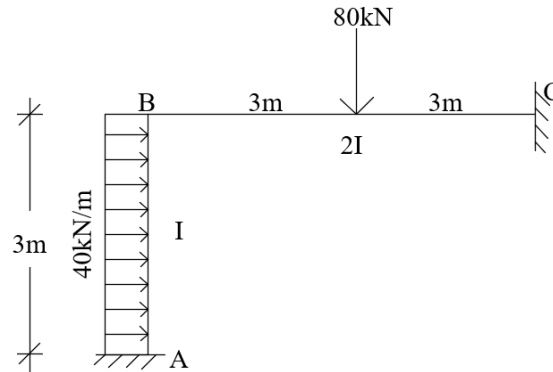


Fig. 2

- b) Analyse the continuous beam shown in Fig. 3 by moment distribution method (8)

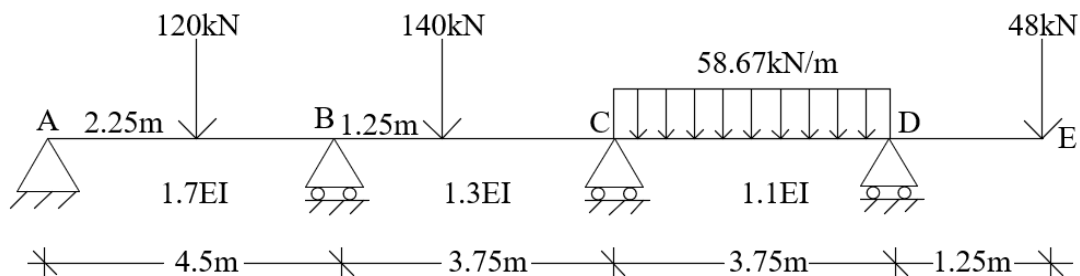


Fig. 3

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Determine the shape factor of T- Section with flange width 120 mm. Depth of web is 110 mm. Thickness of flange and web is 10 mm. If the value of yield stress is 250 N/mm^2 , find the plastic moment capacity of the section (10)
- b) Determine the deflection at free end of a beam in the shape of a quadrant of a circle in plan, fixed at one end and free at the other, with a point load at the free end. (10)
- 8 Derive the expressions for bending moment and twisting moment at any section in a circular ring beam supported by a no: of columns placed at regular intervals. (20)
- 9 Determine the value of collapse load for the portal frame shown in Fig 4. All the members have the same plastic moment of resistance. (20)

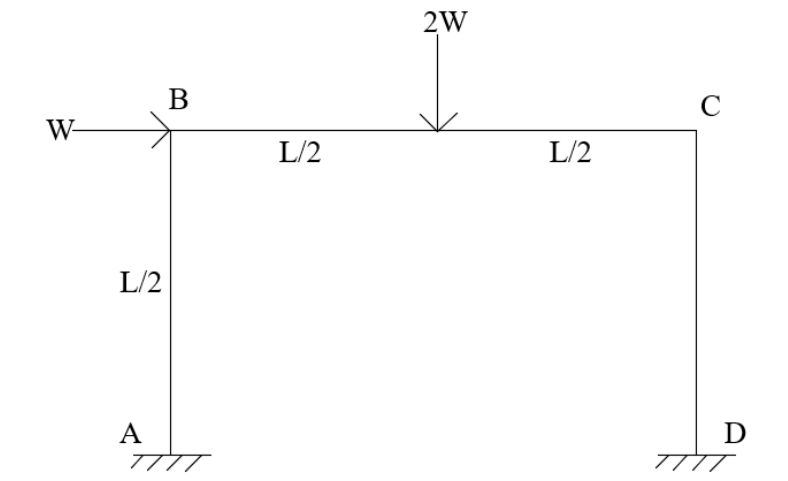


Fig 4

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE303
Course Name: STRUCTURAL ANALYSIS -11

Max. Marks: 100

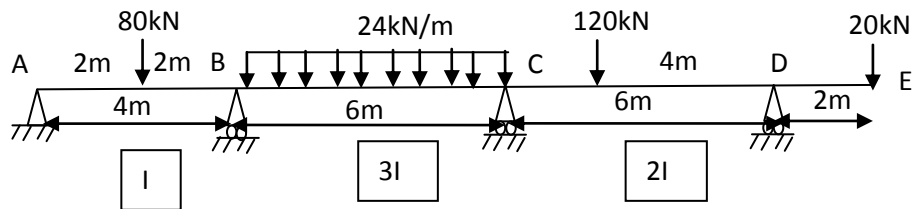
Duration: 3 Hours

PART A

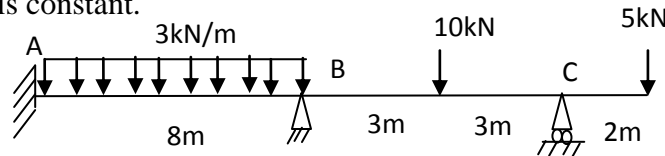
Answer any two full questions, each carries 15 marks.

Marks

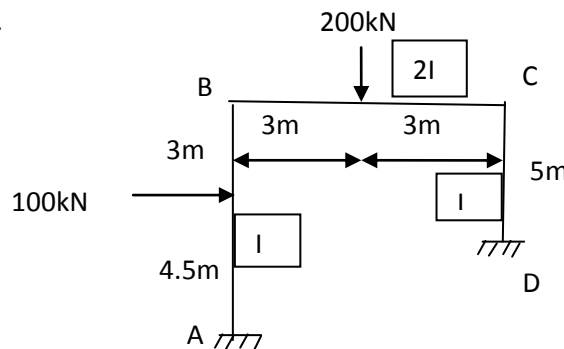
- 1 Analyse the continuous beam shown in figure by three moment theorem. Relative I values are marked below each span. Draw BMD and SFD. (15)



- 2 a) What are the causes of sway in portal frames? (3)
 b) Using slope deflection method, analyse the continuous beam and draw BMD and SFD. EI is constant. (12)



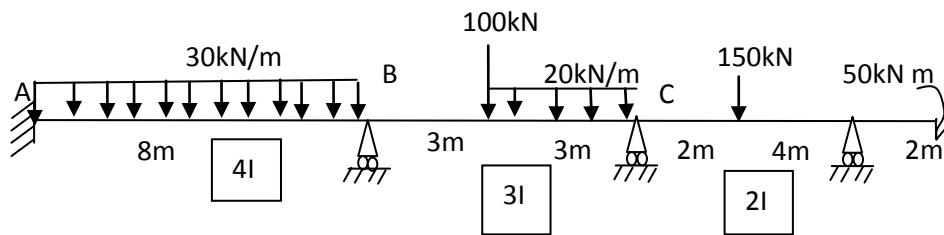
- 3 Analyse the portal frame by slope deflection method and draw shear force diagram and bending moment diagram. Relative I values are marked for each member. (15)



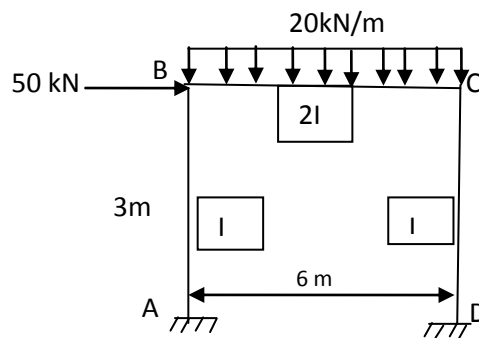
PART B

Answer any two full questions, each carries 15 marks.

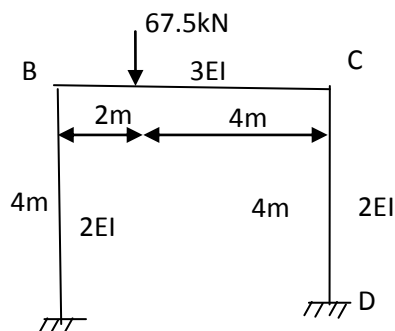
- 4 a) Explain distribution factor and carryover factor (3)
 b) Using moment distribution method, determine the support moments in the continuous beam ABCD. Due to external loading, support B settles by 5mm and C by 10mm. Assume EI as 80,000kN-m². Relative EI values are marked below each span. (12)



- 5 Analyse the portal frame by Kani's method and draw BMD. (15)



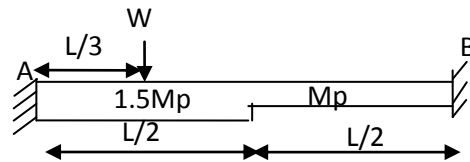
- 6 a) Distinguish between rotation factor and displacement factor (3)
 b) Using Kani's method, find out the end moments of the members of the portal frame. Relative EI values are indicated along the members. (12)



PART C

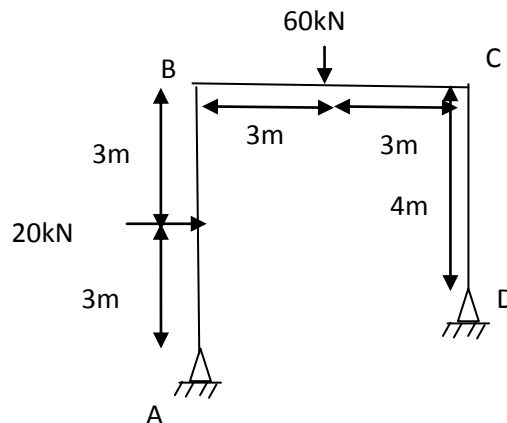
Answer any two full questions, each carries 20 marks.

- 7 a) A curved beam in the form of a quadrant of a circle of radius 3m and having a uniform cross-section is in a horizontal plane. It is fixed at A and free at B and carries a vertical concentrated load 30kN at the free end B. Draw shear force, bending moment and twisting moment diagrams. (6)
- b) Find the bending moment at midspan of a semicircular beam uniformly loaded over the whole beam by a vertical load of intensity 10kN/m and simply supported at the ends and at midspan. Find also the bending moment and twisting moment at quarter points in the beam. Radius of the beam = 5m. (14)
- 8 a) Explain plastic section modulus (2)
- b) State the three theorems of plastic collapse (5)
- c) Determine the collapse load (W_c) for the fixed beam by kinematic method (13)



- 9 a) Determine the shape factor for a triangular section of base b and height h (5)
- b) (15)

Find the value of M_p for the frame of uniform section under the applied factored loads.



Reg No: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
V SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE305

Course Name: GEOTECHNICAL ENGINEERING - II

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- | | | |
|---|--|--|
| 1 | a) Determine the depth at which vertical stress reduces to 10% of the applied pressure on a circular footing. (7½) | |
| | b) A retaining wall supports a two layered backfill having the following properties:
Upper layer: angle of internal friction=30°; unit weight=16KN/m ³ ; thickness=3m
Lower layer: angle of internal friction=45°; unit weight=20KN/m ³ ; thickness=2m
Determine the total passive earth pressure. (7½) | |
| 2 | a) State any 4 major limitations in Boussinesq's theory. Why is the theory still in use in spite of limitations? (7½) | |
| | b) A retaining wall [height=5m] supports a granular backfill [angle of internal friction=36°; unit weight above WT=16KN/m ³ ; unit weight below WT =19KN/m ³] WT table is at a depth of 2m beneath the backfill surface. Determine the total active earth pressure.. (7½) | |
| 3 | a) A uniform pressure acts on a rectangular footing having coordinates [in metres] of corners (0,10), (8,10), (8,0), and (0,0). Find the (m,n) combinations which are to be used for determination of vertical stress [using Fadum's chart] at a depth of 8m vertically beneath the point having coordinates (8,12). (7½) | |
| | b) State the assumptions in Rankine's theory. (7½) | |

PART B

Answer any two full questions, each carries 15 marks.

- | | | |
|---|---|--|
| 4 | a) What are the soil types for which local shear failure can be expected? Draw the typical pressure versus settlement curve for such a failure. (7½) | |
| | b) Design a rectangular combined footing for two columns, each of size 250mmX250mm, the magnitude of column loads being 850kN and 1050kN. c/c distance between columns is 3.8m and a clear spacing of 0.125m only is available beyond the outer face of 850kN column. Take SBC of subsoil as 202kPa. (7½) | |
| 5 | a) Two footings A and B, both having length of 22m, are placed on the surface of a dry, purely granular soil. Widths of footings A and B are 2.5m and 1.5m respectively. Determine the ratio of their net safe bearing capacities. (7½) | |
| | b) Suggest any three methods (with neat sketches) for rectification of tilts in a well foundation. (7½) | |
| 6 | a) Define Gross ultimate bearing capacity, Net ultimate bearing capacity, Net safe bearing capacity and Allowable bearing capacity. (7½) | |
| | b) What are the situations where raft foundations are preferred? What is meant by floating foundation? (7½) | |

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) An RCC pile (of 500mmX500mm size and length 6m) is installed in a granular soil having unit weight $=17\text{kN/m}^3$, coefficient of earth pressure = 1.5; angle of wall friction $=22^\circ$. Determine the ultimate skin friction load that can be carried by pile. (10)
- b) State any two merits of auger boring method of soil exploration compared to wash boring. Mention the soil types for which the auger boring method is applicable. Mention the different types of augers and draw a neat sketch of any one. (10)
- 8 a) A 3X3 friction pile group, each pile having a length of 10m and diameter of 0.4m is installed in a homogeneous clay layer having undrained shear strength of 50kPa. Take adhesion factor as 0.75. Estimate the ultimate load on the pile group. c/c spacing of piles = 0.9m (10)
- b) What is meant by free vibration? Discuss any 3 methods for vibration isolation. (10)
- 9 a) Explain [with a sketch] negative skin friction on pile. A circular concrete pile of diameter 300mm and length 8m is installed in a subsoil consisting of top 2.5m of recently filled up soil (cohesion of 25kPa). Determine the negative skin friction on the pile. Take adhesion factor as 0.5. (10)
- b) What is meant by dilatancy correction? What are the soil types/soil states for which the above correction is applied? Give the related equation for dilatancy correction. (10)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
V SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE305

Course Name: GEOTECHNICAL ENGINEERING – II

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

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|---|---|------|
| 1 | a) Differentiate between isobar and pressure bulb. Give one practical example to highlight the significance of pressure bulb. | (7½) |
| | b) What is meant by passive state of plastic equilibrium of soils? Give two field situations [with sketches] where passive mechanism develops. | (7½) |
| 2 | a) Critically differentiate between Boussinesq's theory and Westergaard's theory. | (7½) |
| | b) A retaining wall supports a backfill with the following properties: Upper layer: angle of internal friction=30°; unit weight=17KN/m ³ ; thickness=2m. Lower layer: angle of internal friction=35°; unit weight=19KN/m ³ ; thickness=4m. Find the total lateral earth pressure, if the retaining wall tends to move towards the backfill. | (7½) |
| 3 | a) Compute the vertical stress at a depth of 1.5m vertically beneath the centre of a circular ring type of footing (width of ring=2m; internal diameter=5m) subjected to a uniform pressure of 175KPa. | (7½) |
| | b) An excavation is to be carried out in a soil with angle of internal friction=30°; cohesion=10KPa. unit weight =20 KN/m ³ . Find the maximum stable depth up to which excavation can be carried out without failure. | (7½) |

PART B

Answer any two full questions, each carries 15 marks.

- | | | |
|---|--|------|
| 4 | a) State the assumptions of Terzaghi's bearing capacity theory. | (7½) |
| | b) State the functions of any 5 elements of a well foundation. | (7½) |
| 5 | a) Estimate the net ultimate bearing capacity of a circular footing of 2.5m diameter placed at 1.5m depth, in a lateritic soil (cohesion=48KPa; unit weight =18KN/m ³). Bearing capacity factors are N _c =10, N _q =3, N _γ =1.5. | (7½) |
| | b) How can the allowable bearing capacity of rafts on clay be estimated? | (7½) |
| 6 | a) Mention any three causes of differential settlement. Suggest any three measures for reducing the same. | (7½) |
| | b) Design a combined footing for 2 columns, if size of both columns are: 350mmX350mm; Column loads=1800kN and 1200kN; C/c distance between columns=4m. Clear spacing beyond the outer face of the 1200kN column=0.175m. Safe bearing capacity of soil=219kPa. | (7½) |

PART C

Answer any two full questions, each carries 20 marks.

- | | | |
|---|---|------|
| 7 | a) A circular concrete pile of diameter 500mm is installed in a clay stratum having | (10) |
|---|---|------|

- undrained shear strength of 99kPa. Determine the length of pile needed, if pile has to carry a load of 370kN with factor of safety of 3 against shear failure. Take adhesion factor as 0.5.
- b) State the I.S. guideline for minimum number of boreholes to be taken for a rectangular area. Determine the minimum number of bore holes needed for a rectangular plot of size (i) 80mX100m and (ii) 300mX80 m? (10)
- 8 a) A 0.3m×0.3m precast concrete pile, 10m long is driven into a ground. The total penetration for the last five blows is observed as 12mm. Determine the ultimate load on pile (Q_u) for the following data: weight of hammer=30kN; Height of fall of hammer=90cm; efficiency of hammer=0.85; sum of the temporary elastic compressions [in mm] of the dolly, packing, pile and ground= $(0.005)Q_u$. where Q_u is in kN. Efficiency of blow may be assumed as 0.5. (10)
- b) Mention any five objectives of site investigation. Also point out any 5 (10) information that can be collected during reconnaissance.
- 9 a) Results of load test on a pile [diameter=450mm] are given below: Estimate the (10) safe load as per I.S.

Load (kN)	225	300	375	450	600	750	900
Settlement (mm)	2.9	4.2	5.5	7.2	11.8	21.5	45

- b) Choose the correct answer from among the following: (10)

[i] The type of vibration isolation wherein the machine foundation is located away from the adjoining structures is called :

- [A] Passive isolation [B] Damping
[C] Amplification [D] Geometric isolation

[ii] Which of the following parameter can be computed, if the values of coefficient of elastic uniform compression, contact area of footing with soil and mass of machine, foundation and mass of participating soil mass are known?

- [A] Maximum amplitude [B] Damping factor
[C] Magnification factor [D] Natural frequency

[iii] Dilatancy correction for N value is applied, only when

- [A] soil is coarse sand below water table and $N > 15$
[B] soil is clay below water table and $N > 15$
[C] soil is fine sand below water table and $N > 15$
[D] soil is fine sand above water table and $N > 15$

[iv] Which of the following statement is NOT TRUE?

- [A] N value (of SPT) depends upon the relative density of cohesionless soils.
[B] N value is underestimated at shallow depth.
[C] Soil samples collected in wash boring are not representative samples.
[D] Free vibrations occur under the influence of a continuous external force.

[v] As per I.S., even if there is no change in soil strata, SPT shall be made at intervals of :

- [A] 1.0m [B] 1.5m [C] 2.0m [D] 3.0m

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
V SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE307
Course Name: GEOMATICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Explain successive bisection of chord method to set out simple circular curve. (7)
- b) Explain error of closure with the help of a sketch. In a traversing, latitude and departure of the sides were calculated and it was observed that $\Sigma \text{latitude} = 1.39$ m and $\Sigma \text{Departure} = -2.17$ m. Calculate the length of the closing error and its orientation. (8)
- 2 a) Two tangents intersect at chainage 60 chain + 60 links, the deflection angle being $52^{\circ}30'$. Calculate the necessary data for setting out a curve of 20 chains radius to connect the two tangents if it is intended to set out the curve by ordinate from long chords. Take peg interval equals to 20 m and length of chain as 20 metres. (10)
- b) Explain elements of a compound curve with a neat sketch. (5)
- 3 a) While making a traverse survey, a surveyor started from point A, walked 1000m in $S 67^{\circ} W$ and reached point B. Then he changed his direction and walked 512 m in $N10^{\circ} E$ and reached point C. Then again he changed his direction and walked 1504 m in $S 65^{\circ} E$ and reached point D. Now the surveyor wants to return to A. Which direction should he move in and how many meters? (10)
- b) Explain consecutive co-ordinates and independent co-ordinates. (5)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Explain signal structure adopted in GPS surveying. Differentiate between code phase and carrier phase measurements. (8)
- b) List down GPS errors and explain any three in detail. (7)

- 5 a) Explain the different phases of GPS survey. (12)
b) List the parameters affecting the accuracy of GPS positioning. (3)
- 6 a) Explain the difference between rapid static method and kinematic method of GPS surveying. (10)
b) What is DGPS. How is it significant? (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) What are the types of scattering in Remote sensing? Differentiate between them. (8)
b) Write a short note on spatial data and attribute data. (6)
c) What is buffering in GIS data analysis? (6)
- 8 a) Explain electromagnetic spectrum and atmospheric window with the help of sketches. (10)
b) Brief on the four different image resolutions of Remote sensing (10)
- 9 a) Explain vector data model. Its advantages and disadvantages. (10)
b) What is RMS error? How is it significant in data analysis (5)
c) With proper sketch, differentiate cylindrical, planar and conical map projection (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE307
Course Name: GEOMATICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Explain direct method without transiting in fast needle method of traversing with the help of suitable sketch. (7)
- b) Explain the elements of a simple circular curve, with a neat sketch. Derive relations between elements of a simple circular curve if radius and deflection angle is given. (8)
- 2 a) Adjust the closing error for the given traverse using Bowditch rule (10)

Line	Length (m)	WCB($^{\circ}$)
AB	160	46
BC	190	130
CD	200	220
DA	180	320

- b) A man travels from a point A, to west direction and reaches point B after 139.6m. Find the latitude and departure of line AB (5)
- 3 a) Explain Rankine's method for setting out simple circular curve. (10)
- b) Explain how you arrive at the length of transition curve based on rate of change of radial acceleration. (5)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) List down the components of GPS and explain the functions of each component. (10)
- b) Explain the principle of position determination by satellite ranging. (5)
- 5 a) List the errors in GPS surveying. Explain any four in detail. (10)
- b) Write a short note on visibility diagram. Illustrate with sketch. (5)

- 6 a) Explain the phases of GPS surveying. (10)
b) Explain static method of GPS surveying. (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Explain vector data model and raster data model. (8)
b) Describe the principle of remote sensing. Differentiate between active and passive sensors in remote sensing. (8)
c) Briefly explain the operations of GIS. (4)
- 8 a) What is meant by multispectral scanning? Explain along track and across track scanning. (10)
b) Explain image resolution and the different types. (10)
- 9 a) What is map projection in GIS? Explain the different types according to preserved property. (10)
b) Differentiate between geographic coordinate system and projected co-ordinate system. (5)
c) Briefly explain overlay in vector data analysis. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
V SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE309

Course Name: WATER RESOURCES ENGINEERING

Max. Marks: 100

Duration: 3 Hours

Graph sheets may be provided

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Describe the Non recording rain gauge with a neat sketch (6)
- b) Determine the mean precipitation for the rectangular area given below by Thiessen Polygon method. Precipitation recorded at rain gauge stations A, B, C and D are 15 cm, 10 cm, 12 cm and 16 cm respectively. The distance between the rain gauge stations A and B is 12 km and that between A and D is 7 km. (5)



- c) The rate of rainfall for successive one hour periods of a 10 hour storm were recorded as 4.0, 6.3, 5.2, 7.5, 8.4, 2.3, 5.4, 4.5, 8.5 and 3.6 cm/hr. Taking value of ϕ – index as 6.0 cm/hr, compute i) Total rainfall excess ii) W- index. (4)
- 2 a) The ordinates of a 4 hour unit hydrograph of a catchment area are given below. (6)

Time in hr	0	4	8	12	16	20	24	28	32
Ordinates m^3/s	0	15	30	25	21	17	14	8	0

Find the ordinates of an 8 hour unit hydrograph for the same basin. Also sketch the hydrograph.

- b) Determine the total infiltration depth for a storm lasting for 5 hours, if the initial infiltration rate is 12 mm/hr, final infiltration rate is 8 mm/hr and constant value describing the rate of decay of the difference between initial and final infiltration (5)

rate is 0.82/h.

- c) What are the assumptions of Unit hydrograph theory? (4)
- 3 a) What is runoff? What are the factors affecting Runoff? (6)
- b) In a catchment area, the annual rainfall recorded by rain gauges A, B, C, D, E and F are 52, 63, 35, 56, 40 and 59 cm respectively. For a 10% error in estimation of mean rainfall, calculate the optimum number of rain gauges in the area. (5)
- c) What are the different types of precipitation? (4)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) What are the factors affecting Duty of water of a canal system? (6)
- b) What is Gross Commanded Area, Culturable commanded area and Unculturable commanded area? (5)
- c) What are the general features of Meandering of rivers? (4)
- 5 a) What are River Training works? What are the classifications of River Training works? (6)
- b) A stream of 120 litre/s was diverted from a canal and 100 litre/s were delivered in the field. An area of 2 hectares was irrigated in 10 hours. The runoff loss in the field was 420 m³. Effective depth of root zone was 1.5 m. Determine Water conveyance efficiency and Water application efficiency. (5)
- c) What is Consumptive use of water? List the methods by which it is determined? (4)
- 6 a) What is Stream Gauging? What are the factors to be considered while selecting a Stream gauging site? (6)
- b) What is a Stage – Discharge curve? (5)
- c) What is Field capacity and Permanent wilting point? (4)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Describe the types of Tube wells? (8)
- b) What are the factors affecting selection of site for a reservoir? (6)
- c) A 30 cm diameter well penetrates 20 m below the static water table. After 24 hours of pumping at the rate of 4000 litre/minute, water level in a test well 85m away from the main well is lowered by 0.48 m, and in a test well 35 m away from

the main well, the drawdown is 1m. a)What is the Transmissibility of the aquifer? b) Also determine the drawdown in the main well.

- 8 a) What is a Mass Inflow curve? How is it used to calculate the reservoir capacity? (8)
b) What are the methods adopted for controlling silting of a reservoir? (6)
c) What is a confined aquifer? Derive an expression to obtain the discharge through a confined aquifer. (6)
- 9 a) Describe the Recuperation test used to find yield of an open well. (8)
b) Explain the procedure to calculate the Life of a reservoir. (6)
c) What is i) Firm yield ii) Secondary yield and iii) Average yield of a reservoir? (6)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE309

Course Name: WATER RESOURCES ENGINEERING

Max. Marks: 100

Duration: 3 Hours

Graph sheets may be provided

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) A rain gauge recorded the following accumulated rainfall during a storm. Plot a Hyetograph for the given data. (6)

Time(am)	7.00	7.05	7.10	7.15	7.20	7.25	7.30
Accumulated rainfall (mm)	0	2	3	7	12	19	20

- b) Describe how infiltration rate is measured using Double ring infiltrometer. (5)
- c) What is Recurrence interval? How is it determined? (4)
- 2 a) The following are the ordinates of a 6 hour storm hydrograph of a catchment area of 426 hectares. (6)

Time	00.00	6 am	12noon	6 pm	00.00	6am	12noon	6 pm	00.00
Ordinates m ³ /s	16	115	230	192	171	117	59	28	16

Construct a 6 hour unit hydrograph for the same basin , if constant base flow is 16 cumecs.

- b) A station 'A' was inoperative while stations B, C, D and E registered 80 mm, 70mm, 83 mm and 79 mm of precipitation. Co-ordinates of B, C, D and E are (7, 6), (10,-8), (-11,-5) and (-5, 5) respectively with coordinates of A as (0, 0). Estimate storm precipitation by Inverse distance method. (5)
- c) A 12 hour storm rainfall with following depths in cm occurs over a basin. (4)
- 3, 3.4, 8.6, 4.9, 11.5, 5, 3, 11, 5.4, 5.8, 1.6, 1.3.** Surface runoff is 20.6 cm. Determine the average infiltration index.

- 3 a) Describe how evaporation measurement is done using IMD land pan. (6)
 b) What is Infiltration? What are the factors affecting Infiltration? (5)
 c) What is S Hydrograph? How is it used to construct a longer or shorter period hydrograph from a longer period hydrograph? (4)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Describe the types of Irrigation. (6)
 b) What is a Guide bank system? (5)
 c) What is Available moisture and Readily available moisture? (4)
 5 a) Describe the use of current meter in measuring velocity of a river. (6)
 b) What are Irrigation efficiencies? (5)
 c) What is Meandering of rivers? (4)
 6 a) Determine the reservoir capacity ,if culturable commanded area is 5200 ha, canal losses are 20% and reservoir losses are 15% (6)

Crop	Base period(days)	Duty at field (ha/cumecs)	Intensity of Irrigation
Wheat	120	1700	20%
Sugarcane	320	1400	20%
Cotton	180	1200	10%
Rice	120	700	15%

- b) Describe the Area Velocity method used for stream discharge measurement. (5)
 c) A crop grown in an area of 5000 ha is fed by a canal system. Find daily consumptive use and discharge in m^3/s required in the area if ,
 Field capacity of soil = 28%
 Optimum moisture = 10%
 Permanent wilting point = 8%
 Effective depth of root zone = 70 cm
 Relative density of soil = 1.3

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Describe the tests to determine the yield of a well. (8)

- b) What are the zones of a storage reservoir? (6)
- c) Derive an expression to find the discharge through an Unconfined aquifer. (6)
- 8 a) A gravity well has a diameter of 65 cm. The depth of water in the well is 45 m (8)
before pumping has started. When pumping is done at the rate of 40 litres/s, the drawdown in a well 12 m away is 4.5 m and in another well, 24 m away, the drawdown is 3m. Determine i) Radius of zero drawdown ii) Coefficient of permeability iii) Drawdown in the well iv) Maximum rate at which water can be discharged from the well.
- b) What are the types of Dam Reservoirs? (6)
- c) During a Recuperation test, water in an open well was depressed by pumping by (6)
3 metres and it recuperated 2 metres in 75 minutes. Find i) Yield from a well of 4m diameter under a depression head of 4 metres ii) Diameter of the well to yield 600 litres/minute under a depression head of 2.5 metres.
- 9 a) Describe the use of Mass Inflow curve to determine capacity of a reservoir. (8)
- b) Describe the divisions of Subsurface water. (3)
- c) Define i) Coefficient of Transmissibility ii) Storage coefficient (3)
- d) What is Trap efficiency? What is its significance? (6)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
V SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE361

Course Name: ADVANCED CONCRETE TECHNOLOGY

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- | | | |
|---|---|-----|
| 1 | a) What is gap graded aggregate? State the advantages of using gap graded aggregates in concrete construction. | (4) |
| | b) What are the various factors which affect the workability of concrete? Explain. | (7) |
| | c) Distinguish between plasticizers and super plasticizers. | (4) |
| 2 | a) What is the role of chemical admixtures in concrete? Mention four types of chemical admixtures and their functions. | (7) |
| | b) Explain in detail the sampling methods for aggregates. | (6) |
| | c) What are the stages of transformation of fresh concrete to hardened concrete? | (2) |
| 3 | a) What are the different components of hardened concrete? What is a transition zone? | (6) |
| | b) Explain the chemical composition, properties and uses of high alumina cement, quick setting and blast furnace slag cement. | (9) |

PART B

Answer any two full questions, each carries 15 marks.

- | | | |
|---|--|------|
| 4 | a) Discuss on carbonation shrinkage. | (5) |
| | b) Why is cube strength more than cylinder strength in concrete? | (4) |
| | c) Discuss the factors to be considered in the design of concrete mixes. | (6) |
| 5 | a) Discuss the step-by-step procedure of BIS method of concrete mix design. | (15) |
| 6 | a) Describe the influence of mineral admixtures in concrete. Explain any two mineral admixtures in detail. | (10) |
| | b) Define creep. List the factors affecting creep. | (5) |

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Discuss the factors influencing the properties of fibre reinforced concrete. (6)
- b) Explain alkali silica reaction. (6)
- c) Explain any two non-destructive tests in concrete. (8)
- 8 a) Describe the causes of corrosion of steel in concrete. (6)
- b) Write a note on:
- a. Ready mixed concrete (10)
- b. Mass concrete
- c) State the advantages and limitations of UPV method. (4)
- 9 a) What is the influence of prefabrication technology on modern construction industry? (10)
- b) Describe the influence of various components of high strength concrete. (10)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE361

Course Name: ADVANCED CONCRETE TECHNOLOGY

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- | | | |
|---|--|------|
| 1 | a) Explain in detail any three tests for cement. | (9) |
| | b) What are light weight aggregates? Discuss any two uses of them with examples. | (3) |
| | c) Explain segregation and bleeding in concrete. | (3) |
| 2 | a) Discuss the hydration reaction of different cement compounds. | (10) |
| | b) What is meant by batching of concrete? What are the different types? Which one is better and why? | (5) |
| 3 | a) List the different types of cement. | (4) |
| | b) Mention the classification of aggregate in accordance with size and source. | (8) |
| | c) What are blended cement? State its advantages. | (3) |

PART B

Answer any two full questions, each carries 15 marks.

- | | | |
|---|---|------|
| 4 | a) What are the effects of creep on concrete? | (4) |
| | b) Draw the typical stress strain curve for concrete. Explain how to determine the various elastic moduli for concrete. | (6) |
| | c) State the physical and chemical characteristics of GGBS (Ground Granulated Blast Furnace Slag). | (5) |
| 5 | a) Discuss the step-by-step procedure of ACI method of concrete mix design. | (12) |
| | b) What is the significance of compressive strength of concrete? | (3) |
| 6 | a) List three mineral admixtures along with their advantages. | (6) |
| | b) Explain the procedure for determining the flexural strength of concrete under | (6) |

four point bending test.

- c) Differentiate between creep and shrinkage in concrete. (3)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) What is meant by reinforcement cover? How it is measured? (5)
- b) Explain any two methods for testing fresh stage properties of self-compacting concrete. (7)
- c) Discuss in brief the mechanism of chloride induced corrosion of steel and its control. (8)
- 8 a) Explain in detail the types of polymer concrete highlighting its composition, properties and applications. (10)
- b) What is carbonation of concrete? Explain the factors affecting carbonation of concrete. (6)
- c) Explain the pull-out test on concrete. (4)
- 9 a) Write notes on under water concreting and mass concreting. (10)
- b) What are the factors affecting durability? (4)
- c) Discuss in detail the manufacture of roller compacted concrete. What are its applications? (6)

Reg No.: _____

Name.: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE 363

Course Name: GEOTECHNICAL INVESTIGATIONS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

1)

- a) Why soil exploration is considered important while planning and designing engineering structures? **4 marks**
- b) A loading test was conducted with a 300 mm square plate at a depth of 2 m below the ground surface in a cohesive soil. The water table is located at a depth of 3.5 m below the ground surface

Pressure kN/m ²	50	100	200	300	400	500	600
Settlement, mm	1.5	2.0	4.0	7.5	12.5	20.0	40.0

- i) Plot the pressure-settlement curve and determine the failure stress.
- ii) Determine the size of a square column footing to carry a net load of 2500 kN at 2 m depth. **7 marks**
- c) What should be the major steps involved while planning exploration program of a structure. **4 marks**
- 2)
- a) Using neat sketches explain rotary drilling and its applications. **5 marks**
- b) With necessary sketches, explain how Plate Load Test is conducted for sandy soils if the level of water table is less than 1 m from the level of proposed foundation. **5 marks**
- c) Give the minimum depth of exploration to be carried out for the following cases as per IS specifications.
- i) Isolated spread footing
- ii) Pile foundations
- iii) Road cuts
- iv) Well foundations
- v) Embankment fills **5 marks**

3)

- a) What should be the borehole spacing for the following cases
- i) An industrial complex covering large area
 - ii) A compact building covering an area of 4000 m².
- b) What are the objectives of soil exploration?
- c) State the limitations of Plate Load Test that restrict its application.

4 marks

5 marks

6 marks

PART B

Answer any two full questions, each question carries 15 marks.

4.

- a. An N value of 40 was obtained while conducting SPT in dense sand at a depth of 20m from the surface. If the density of sand deposit is 16kN/m³, find the actual N value corrected for overburden.

5 marks

- b. What are the significant applications of Pressuremeter Tests? Explain the procedure for the test in fine grained soils.

5 marks

- c. Explain the necessity of correcting the N value for Dilatancy.

5 marks

5.

- a. If it is required to find the friction resistance of soil at a given site, which cone penetration test would you recommend? Also explain the procedure of obtaining skin friction and end resistance from that test with suitable sketches.

5 marks

- b. If you are given the velocity of shock-waves in different soils, which geophysical test would you recommend and also explain the procedure. Can it be used to identify the soil profile of an area where there are buried conduits? Explain.

4 marks

- c. Explain the procedure to find the following, using Electrical Resistivity Method

- i. For finding the boundaries of soil within a strata
- ii. For finding changes in a strata with increasing depth

6 marks

6.

- a. Compare the critical advantages of Static Cone Penetration Test over Static Cone Penetration Test. **4 marks**
- b. Data set from a seismic refraction test is given below.

Distance from impact point to geophone (m)	10	20	40	80	140
Time to receive wave (s)	0.025	0.050	0.100	0.110	0.120

- i) Plot the time travel data and determine the seismic velocity for the surface layer and underlying layer. **8 marks**
- ii) Determine the thickness of the upper layer. **8 marks**
- c. Give the advantages and disadvantages of Standard Penetration Test. **3 marks**

PART C

Answer any two full questions, each question carries 20 marks

7.

- a. What are the properties of the sampler which govern whether the collected soil sample is undisturbed or not? **6 marks**
- b. Explain the difference between undisturbed and disturbed samples. **6 marks**
- c. State the procedure for estimation of safe load from vertical compression Pile load Test on single and group piles as per latest revision of IS 2911 . **8 marks**

8.

- a. What are the factors that cause sample disturbances and suggest remedies for preventing the same. **6 marks**
- b. The following data refers to a pile load test carried out on a 500 mm diameter, 10 m long pile.

Load on pile top (kN)	150	200	250	300	400	500	600
Total Settlement of the pile top (mm)	1.45	2.25	2.75	3.60	5.75	10.75	30.00

- Plot the load settlement curve and estimate the ultimate load on the pile **8 marks**
- c. Sketch a borehole log chart. Explain the preparation of a geotechnical investigation report **6 marks**

9.

a. What are representative soil samples? How are they obtained?

6 marks

b. What are the precautions to be followed while handling and transporting soil samples?
Why is it necessary?

6 marks

c. Explain the procedure for separating end bearing and skin friction resistance from pile load tests.

8 marks

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE363

Course Name: GEOTECHNICAL INVESTIGATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Explain in detail a site investigation programme. (10)
 b) What is the criteria for fixing the number and spacing of boreholes? (5)
- 2 a) Explain the relevance of significant depth. What is the minimum depth of exploration for square footing and multi-storeyed building? (7)
 b) With a figure, explain the test procedure for plate load test. (8)
- 3 a) The results of two plate load tests are given in the following table (5)

Plate diameter, B (m)	Total load, Q (kN)	Settlement (mm)
0.305	32.2	20
0.610	71.8	20

A square column footing has to be constructed to carry a total load of 715 kN.

The tolerable settlement is 20 mm. Determine the size of the foundation.

- b) What are the limitations of plate load test? (5)
 c) Define modulus of subgrade reaction. (5)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Explain the various corrections to be applied for SPT test (10)
 b) The observed SPT N value in a deposit of fully submerged fine silty sand was 45 (3)
 at a depth of 6.5 m. The average saturated unit weight of soil is 19.5 kN/m^3 . Find the corrected SPT number.
 c) List any two advantages of static cone penetration test. (2)
- 5 a) Give a critical comparison between Standard Penetration test, Static cone penetration test and Dynamic Cone Penetration test. (7)
 b) What is the significance of pressure meter modulus and limit pressure? Explain (8)

the test procedure for obtaining the same.

- 6 a) With a neat diagram, explain the process of seismic refraction method. (10)
 b) Differentiate between electrical profiling and electrical sounding method (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Sketch a piston sampler and explain its working. (10)
 b) Briefly explain the method of collecting sand samples from beneath the water table. (5)
 c) During a sampling operation, a thin walled sampler was pushed into soft clay to a distance of 600 mm. The recovered length of the sample was found to be 589 mm. What is the recovery ratio? Also mention the sample quality. (5)
- 8 a) Explain the factors affecting sample disturbance and ways to reduce them. (10)
 b) Define Rock quality designation and recovery ratio. (5)
 c) Sketch a typical soil bore log with SPT test data. (5)
- 9 a) Calculate core recovery and rock quality designation from the following borehole core logging data. Core run length=150 cm. (5)

Core recovery (cm)
25
5
5
7.5
10
12.5
7.5
10
15
10
5
12.5

- b) A pile load test is conducted on a 30 cm diameter pile of length 12 m. The results (10)

are given in the table below:

Load in kN	Settlement during loading in cm	Settlement during unloading in cm
0	0	4
500	0.85	4.6
1000	1.65	5.2
1500	2.55	5.5
2000	3.8	5.8
2500	6	6

Plot the graph and determine the allowable load.

(Chart papers should be provided for this question)

- c) What are the contents to be included in a preliminary soil investigation report? (5)
