

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: CE363**

**Course Name: GEOTECHNICAL INVESTIGATION**

Max. Marks: 100

Duration: 3 Hours

*Graph sheet is supplied on request.*

**PART A**

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

- |   |    |  |       |
|---|----|--|-------|
|   |    |  | Marks |
| 1 | a) | List the objectives of soil exploration  | (5)   |
|   | b) | What are the guide lines provided in IS code on fixing the spacing of bore holes?                  | (5)   |
|   | c) | What is significant depth ?  | (5)   |
| 2 | a) | Explain wash boring with the help of a sketch.   | (7)   |
|   | b) | A plate load test was conducted on a uniform deposit of sand and the following data were obtained. | (8)   |

|                               |     |     |     |     |      |      |      |
|-------------------------------|-----|-----|-----|-----|------|------|------|
| Pressure (kN/m <sup>2</sup> ) | 5   | 100 | 200 | 300 | 400  | 500  | 600  |
| Settlement(mm)                | 1.5 | 2.0 | 4.0 | 7.5 | 12.5 | 20.0 | 40.0 |

Size of the plate is 75 cm\*75 cm and that of the pit is 3.75m\*3.75m \*1.5 m. Plot the pressure settlement curve and determine the safe pressure corresponding to footing settlement of 15mm.

- |   |    |  |       |
|---|----|--|-------|
|   |    |  | Marks |
| 3 | a) | Explain the major steps involved in reconnaissance for a geotechnical investigation of a multi storied building. | (7)   |
|   | b) | What are the different types of augers? Draw neat sketches.  | (8)   |

**PART B**

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

- |   |    |  |       |
|---|----|--|-------|
|   |    |  | Marks |
| 4 | a) | What are the corrections to be applied to SPT values? Explain.   | (7)   |
|   | b) | Differentiate between electrical profiling and electrical sounding.  | (8)   |
| 5 | a) | Give a critical comparison of CPT, SPT and DCPT.   | (8)   |
|   | b) | The observed SPT value (N) in a deposit of fully submerged fine silty sand was 45 at a depth of 6.5m. The average saturated unit weight of soil is 19.5 kN/m <sup>3</sup> Find the corrected SPT number. | (7)   |
| 6 | a) | Write down the procedure and the limitations of seismic refraction method.   | (7)   |
|   | b) | Explain in detail pressure meter test.   | (8)   |

**PART C**

*Answer any two full questions, each carries 20 marks.*

- |   |    |  |       |
|---|----|--|-------|
|   |    |  | Marks |
| 7 | a) | Define i) Area ratio, ii) Inside clearance iii) Outside clearance iv) Recovery ratio.  | (6)   |
|   | b) | Explain with a neat sketch Piston sampler and a Split spoon sampler.   | (7)   |
|   | c) | Compute the area ratio of a thin walled tube sampler of external diameter 6.0 cm and wall thickness 2.25mm and comment on the type of soil sample obtained using this sampler. | (7)   |
| 8 | a) | Differentiate between bore log and soil profile.   | (8)   |
|   | b) | Explain IS code provision to calculate safe load in static pile load test on a single pile.  | (8)   |
|   | c) | Draw a typical bore log chart.   | (4)   |
| 9 | a) | Explain the factors affecting sample disturbance. What are the precaution to be taken in handling and transporting soil samples?   | (10)  |
|   | b) | What is rock quality designation ?   | (4)   |
|   | c) | Differentiate between static and cyclic pile load test.  | (6)   |



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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: CE309**

**Course Name: WATER RESOURCES ENGINEERING (CE)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

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

- |   |  |       |
|---|--|-------|
|   |  | Marks |
| 1 | a) What are the various methods of computing average rainfall over a basin?  | (7)   |
|   | b) The average annual rainfall depths recorded at 5 rain gauge stations are 910,1070,1410,810 and 500mm respectively. If the average depth of rainfall over the basin is to be estimated within 10% error, determine the additional number of gauges needed. | (8)   |
| 2 | a) State the uses and limitations of unit hydrograph.  | (5)   |
|   | b) Ordinates of a 4hr unit hydrograph are given below. Derive the ordinates of a 12hr unit hydrograph.   | (10)  |

|                                   |   |    |    |     |     |     |    |    |    |    |    |    |
|-----------------------------------|---|----|----|-----|-----|-----|----|----|----|----|----|----|
| Time (h)                          | 0 | 4  | 8  | 12  | 16  | 20  | 24 | 28 | 32 | 36 | 40 | 44 |
| Ordinates of<br>4hr UH<br>(Cumec) | 0 | 20 | 80 | 130 | 150 | 130 | 90 | 52 | 27 | 15 | 5  | 0  |

- |   |   |       |
|---|---|-------|
|   |   | Marks |
| 3 | a) What are the factors that affect evaporation from a water body?  | (5)   |
|   | b) What is $\Phi$ index?  | (2)   |
|   | c) Explain the experimental method of determination of infiltration capacity using double ring infiltrometer. | (8)   |

**PART B**

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

- |   |   |       |
|---|---|-------|
|   |   | Marks |
| 4 | a) Explain the various methods of surface irrigation.   | (10)  |
|   | b) What are the objectives and classification of river training works?  | (5)   |
| 5 | a) What are the factors affecting duty?   | (5)   |
|   | b) A water course has culturable command area of 2600 hectares out of which the intensities of irrigation for perennial sugar cane and rice crops are 20% and 40 % respectively .The duty for these crops at the head of the water course are 750 hectares per cumec and 1800 hectares per cumec respectively. Find the discharge required at the head of water course if the peak demand is 120% of the average requirement. | (10)  |
| 6 | a) Explain the stream flow measurement by area velocity method  | (10)  |
|   | b) Define stage discharge curve.  | (2)   |
|   | c) Define Flow and lift irrigation.   | (3)   |

## PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) The following information is available regarding the relationship between trap efficiency and capacity inflow ratio for a river (10)

|                        |     |     |     |      |     |      |     |      |      |      |
|------------------------|-----|-----|-----|------|-----|------|-----|------|------|------|
| Capacity in flow ratio | 0.1 | 0.2 | 0.3 | 0.4  | 0.5 | 0.6  | 0.7 | 0.8  | 0.9  | 1    |
| Trap efficiency        | 87  | 93  | 95  | 95.5 | 96  | 96.6 | 97  | 97.2 | 97.3 | 97.5 |

Find the probable life of the reservoir with an initial reservoir capacity of 30 million cubic meters if the annual flood inflow is 60 million cubic meters and the average annual sediment inflow is 3600000KN. Assume a specific weight of sediment equal to 12KN/m<sup>2</sup>. The useful life of the reservoir will terminate when 80% of initial capacity is filled with sediment

- b) What is a flow duration curve? (5)
- c) What are the methods for the control of river sedimentation? (5)
- 8 a) Derive an expression for the yield of an open well using Recuperation test. (10)
- b) With a neat sketch describe the vertical distribution of ground water. (10)
- 9 a) Explain the method of calculating reservoir capacity for a specified yield from the mass inflow curve. (10)
- b) The amounts of water flowing from a certain catchment area at the proposed dam site are given in the following table. Determine the minimum capacity of the reservoir if water is to be used to feed the turbines of the hydropower plant at a uniform rate and no water is to be spilled over. (10)

| MONTH     | INFLOW ( x 10 <sup>7</sup> m <sup>3</sup> ) |
|-----------|---|
| JANUARY   | 2.83  |
| FEBRUARY  | 4.25  |
| MARCH     | 5.66  |
| APRIL     | 18.40                                       |
| MAY       | 22.64                                       |
| JUNE      | 22.64                                       |
| JULY      | 19.81                                       |
| AUGUST    | 8.69  |
| SEPTEMBER | 7.10  |
| OCTOBER   | 7.10  |
| NOVEMBER  | 5.66  |
| DECEMBER  | 5.66  |

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: CE307**  
**Course Name: GEOMATICS (CE)**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Compare fast needle method and loose needle method of traverse surveying. (3)  
 b) What is meant by closing error? How will you distribute the angular error of closure? (6)  
 c) The following are the lengths and magnetic bearings of the sides of a traverse ABCD. Find the error of closure. (6)

| Line | Length ( metres) | Bearing |
|------|------------------|---------|
| AB   | 470              | 340°52' |
| BC   | 640              | 85°40'  |
| CD   | 430              | 170°40' |
| DE   | 560              | 265°12' |

- 2 a) Explain any two methods of setting out simple curves. (4)  
 b) Explain the determination of length of transition curve by arbitrary gradient method and time rate method. (4)  
 c) The following data refer to a compound circular curve which deflects to the right Total deflection angle 95°, Degree of the first curve 4°, degree of the second curve 6°, Point of intersection of two straight is at 915m. Determine the chainages of the tangent points and point of compound curvature, given that the latter point is 126m from the point of intersection at an external angle of 290° from the first tangent. (7)
- 3 a) Explain the method of balancing of closed traverse by Transit Rule. (3)  
 b) What are the field checks in a closed traverse and in an open traverse? (4)  
 c) Two tangents intersect at chainage 60 + 60, the deflection angle being 52°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 offsets from chords. Take peg interval equals to 20 m and length of chain as 20 metres. (8)

**PART B***Answer any two full questions, each carries 15 marks.*

- 4 a) Explain the components of GPS and the working principle. (10)  
 b) Explain the principle of position determination by satellite ranging. (5)
- 5 a) Explain static and rapid static methods of GPS survey. (10)  
 b) What is meant by visibility diagram? Illustrate with sketch. (5)

- 6 a) List the errors in GPS ranging. Explain any two in detail. (8)  
b) What is meant by DGPS? Explain code based and carrier based DGPS techniques. (7)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) What is meant by multispectral scanning? Explain along track and across track scanning. (10)  
b) Describe the principle of remote sensing. Explain passive and active remote sensing. (10)
- 8 a) Write short notes on: (6)  
i) Spatial data ii) Attribute data  
b) Explain geographic coordinate system and projected coordinated system. (8)  
c) Explain Mercator projection. Write down its properties and limitations (6)
- 9 a) What is meant by spectral reflectance? Explain the reflectance characteristics of vegetation, soil and water with the help of spectral reflectance curve. (10)  
b) List down the types of map projection according to projection surface. Explain any two with sketches. (10)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**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) What are the assumptions in the Boussinesq's formula for stress distribution?   | (5)   |
|   | b) A water tank is founded on a circular ring type foundation. The ring is of 10m external diameter and 6m internal diameter. Assuming a uniformly distributed load of 300kPa, determine the vertical pressure at a depth of 6m below the centre of the foundation.  | (5)   |
|   | c) What is pressure bulb? Discuss its significance.  | (5)   |
| 2 | a) Explain the use of Newmark's chart  | (5)   |
|   | b) A wall of 8m height retains a non-cohesive backfill of dry unit weight 18kN/m <sup>3</sup> and $\phi = 30^\circ$ . Using Rankine's theory find the total active thrust on the wall and the point of application if it carries a uniform surcharge load of 10kPa.  | (10)  |
| 3 | Compute the total lateral earth thrust exerted by a layered backfill of height 10m if the wall has a tendency to move towards backfill. The upper layer of thickness 6m has angle of internal friction $32^\circ$ and saturated unit weight 18kN/m <sup>3</sup> . The lower layer has angle of internal friction $28^\circ$ , cohesion 20kPa, and saturated unit weight 19kN/m <sup>3</sup> . The backfill also supports a uniform surcharge of intensity 8kN/m <sup>2</sup> . Water table is at a depth of 5m below the surface of the backfill. Also find the point of application. Soil above water table is also saturated | (15)  |

**PART B**

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

- |   |   |      |
|---|---|------|
| 4 | a) What are the assumptions in Terzaghi's bearing capacity theory   | (5)  |
|   | b) A square footing of 2mx2m is provided at a depth of 1m, in a sandy soil with an angle of internal friction of $30^\circ$ . Compute the net safe bearing capacity of the soil with a factor of safety of 3, when the water table is at a depth of 0.5m & 1.5m below the ground level. Given $G = 2.65$ , $e = 0.7$ , Degree of saturation above water table = 80%, $N_c=95$ , $N_q=80.4$ , $N_\gamma=100.2$ . | (10) |
| 5 | a) Differentiate between general and local shear failure of soil.   | (5)  |
|   | b) What remedial measures can be taken to control the differential settlement of foundations?   | (5)  |
|   | c) Under what situations raft foundation is preferred?  | (5)  |
| 6 | a) Explain with neat sketches, the various elements of a well foundation.   | (7)  |
|   | b) Design the plan dimensions of a trapezoidal footing to support two adjacent columns at a centre to centre distance of 5m carrying loads of 1500kN and  | (8)  |

3000kN. The smaller column is of size 400mmx400mm and is at a clear distance of 250mm from the property line. The bigger column is of size 750mmx750mm. The permissible soil pressure is 300kPa.

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) What is negative skin friction? (5)  
b) What is dynamic pile capacity? (5)  
c) A group of 9 piles 12m long and 250mm in diameter is to be arranged in a square form in clay with an average unconfined compressive strength of 60kN/m<sup>2</sup>. Determine the centre to centre spacing of the pile for group efficiency of 1. Neglect bearing at the tip.  $\alpha=0.9$  (10)
- 8 a) Explain mass spring model for undamped free vibration (5)  
b) Explain with a neat sketch, the wash boring method. What are its advantages and disadvantages? (7)  
c) Using modified Hiley's formula, determine the safe load that can be carried by a pile. The gross weight of the pile is 1400kg, weight of hammer 2000kg, height of fall 91cm, hammer efficiency 70%, average penetration under the last 5 blows is 10mm, coefficient of restitution is 0.55 and the factor of safety is 2.5. assume  $C=2.5$  and  $e = 0.5$  (8)
- 9 a) Explain in detail the procedure for standard penetration test. What are the corrections to be applied to the N-Value? (15)  
b) What are the main objectives of the site investigation? (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: CE303**

**Course Name: STRUCTURAL ANALYSIS –II (CE)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

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

- |   |   | Marks |
|---|---|-------|
| 1 | Derive the three-moment theorem equations for general loading.  | (15)  |
| 2 | a) Analyse the continuous beam shown in Fig. 1, using three-moment theorem (Assume $EI$ as constant throughout the beam). Draw BMD. | (7)   |

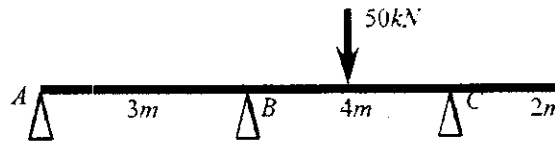


Fig. 1

- |    |  |     |
|----|--|-----|
| b) | Find the bending moments at B and C of the continuous beam shown in Fig. 1, using slope deflection method (Assume $EI$ as constant throughout the beam). | (8) |
| 3  | Analyse the 2D frame shown in Fig. 2, using slope deflection method. Draw BMD.   |     |

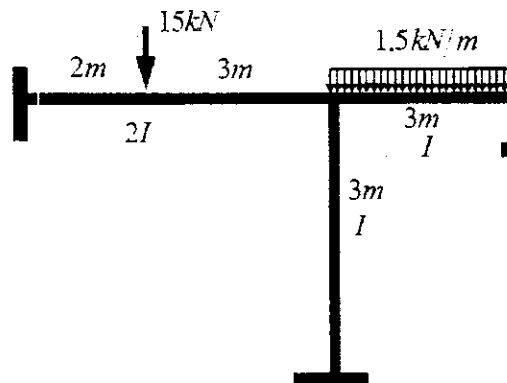


Fig. 2

(15)

**PART B**

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

- |   |  |      |
|---|--|------|
| 4 | Analyse the 2D frame shown in Fig. 2, using moment distribution method. Draw BMD.    | (15) |
| 5 | a) Derive expressions for stiffness at the near-end and carry over factor for a beam | (8)  |

B

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with hinged far-end.

- b) Differentiate between moment distribution method and Kani's method. (7)
- 6 Analyse the 2D frameshown in Fig. 3, using Kani's method. Draw BMD. (15)

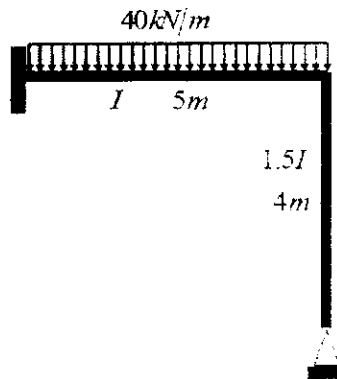


Fig.3

(15)

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 Analyse and draw bending moment and twisting moment diagrams for a beam semi-circular in plan, and supported at three equally spaced hinges. The radius of the beam in plan is 3m, and it carries a UDL of 10kN/m. (20)
- 8 a) Derive expressions for shear force, bending moment and torsion of a beam with 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)
- b) Find out shape factor for an isosceles triangular section of base  $b$  and height  $h$ . (10)
- 9 Find the plastic moment capacity required for the beam shown in Fig. 4. Assume uniform section throughout. (20)

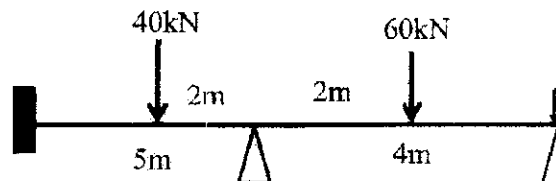


Fig. 4

(20)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: CE301**

**Course Name: DESIGN OF CONCRETE STRUCTURES I (CE)**

*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) Explain balanced, under reinforced and over reinforced sections in the context of Limit state design philosophy.   | (5)  |
|   | b) Derive the expressions for stress block parameters in limit state of flexure and hence the expression for moment of resistance of a singly reinforced rectangular section.   | (10) |
| 2 | a) List various types of shear reinforcements commonly used. Explain each with neat sketches.   | (5)  |
|   | b) Determine the ultimate moment of resistance of a singly reinforced beam of width 300mm and effective depth 450mm reinforced with 3 bars of 25mm diameter. Assume M20 grade concrete and Fe415 grade steel.   | (10) |
| 3 | a) What is bond in reinforced concrete? Define development length and derive an expression for development length.  | (5)  |
|   | b) A simply supported beam 230mm x 550mm effective depth, is reinforced with 4 bars of 20mm diameter on the tension face. If the beam is subjected to a vertical shear of 100kN at the critical section, check the adequacy of the section in shear and design the shear reinforcement, if necessary. Use M25 concrete & Fe415 grade steel. | (10) |

**PART B**

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

- |   |  |      |
|---|--|------|
| 4 | a) Design and detail a singly reinforced concrete beam of rectangular section subjected to a uniformly distributed live load of 12kN/m over the entire span. Clear span is 5m. The beam is supported on masonry wall, 230mm thick on both sides. Assume moderate exposure conditions. Use M25 grade concrete and Fe 415 grade steel. | (10) |
|   | b) What are the situations which demand doubly reinforced section? Derive the expression for ultimate moment of resistance of a doubly reinforced rectangular section.   | (5)  |
| 5 | a) Sketch typical reinforcement detail in a continuous slab.   | (5)  |
|   | b) Determine the ultimate moment of resistance of a doubly reinforced rectangular beam of width 300mm and overall depth 600mm reinforced with 3-32mm diameter bars on tension side and 2-25mm diameter bars on compression side.   | (10) |

**A**

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Assume effective cover on both sides as 50 mm. Use M20 concrete & Fe250 steel

- 6 a) Differentiate between one way slab and two way slab. (5)  
b) Design and detail a simply supported slab for a room of interior dimension 8m x 3.5m, subjected to an imposed load of  $8\text{kN/m}^2$ . Thickness of supporting wall is 300mm. Use M20 concrete and Fe415 steel. Assume moderate exposure conditions. (10)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Explain the procedure for flexural crack width estimation in reinforced concrete members as per IS 456. (5)  
b) Design and detail a simply supported slab for a room of interior dimension 5m x 4m, subjected to an imposed load of  $8\text{kN/m}^2$ . Corners of the slab are restrained against lift up. Use M20 concrete and Fe415 steel. Assume moderate exposure conditions. Perform all necessary checks except shear check. (15)
- 8 a) Design and detail a dog legged stair for an office building for the following data: (15)  
Clear height between floors = 3.2m, Rise = 160 mm, Tread = 270mm, Width of flight = 1.25m, Landing width = 1.25m, Live load =  $5\text{kN/m}^2$ , Load of finish =  $1\text{kN/m}^2$ .  
Assume the stair to be supported on 230mm thick masonry walls at the outer edges of landing, parallel to the risers. Assume M20 concrete and Fe415 steel and Mild exposure conditions. Perform all necessary checks except shear check.
- b) Explain how deflection serviceability is ensured on beams. (5)
- 9 a) Define slenderness ratio. What are its implications in the design of RC comp members? (5)  
b) List the functions of transverse reinforcement in column. Sketch various types of transverse reinforcements commonly used. (5)  
c) Design a short square column to carry a factored axial load of 3000kN, using M20 concrete and Fe415 steel. (10)

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