MANIPAL INSTITUTE OF TECHNOLOGY
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FOURTH SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, APRIL- MAY 2024

GEOTECNICAL ENGINEERING [CIE 2221]
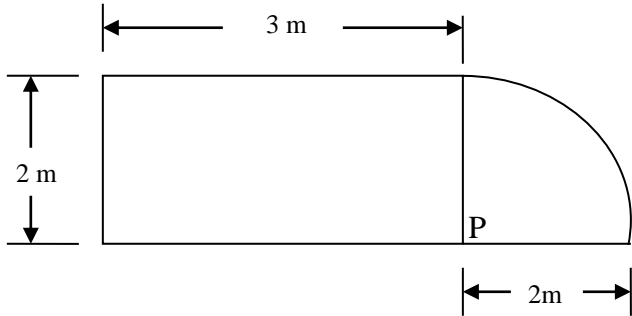
(-05 -2024)

Time: 3 HRS.   MAX. MARKS: 50

Note: 1. Answer all questions.
   2. Any missing data may be suitably assumed.
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Q. No		MARKS	COS	BL
1A	Illustrate i) Kaolinite clay mineral ii) consistency limits iii) hydrometer analysis	3	1	2
1B	i) Illustrate the procedure to obtain the relationship between bulk unit weight (γ), specific gravity (G), degree of saturation (Sr), voids ratio (e) and unit weight of water (γ_w). ii) A specimen of soil has porosity of 40% and specific gravity 2.6. Evaluate a) void ratio b) unit weight if soil is 80% saturated c) water content if soil is 60 % saturated	4	1	3
1C	A saturated specimen of soil with volume 4.2×10^{-4} m^3 has weight 8.6×10^{-3} kN. On oven drying the volume and weight of the specimen reduces to 3.1×10^{-4} m^3 and 5.2×10^{-3} kN respectively. Evaluate i) shrinkage limit ii) shrinkage ratio iii) volumetric shrinkage	3	1	3
2A	Illustrate the procedure to classify fine grained soils as per IS classification system	2	1	2
2B	Depth of water in the well is 4 m. Below the bottom of the well lies a layer of sand 3 m thick overlying clay deposit. Following are the properties of sand and clay deposits Sand: G=2.65 and water content 20% Clay: G=2.7 and voids ratio 0. 45 Evaluate total and effective stresses at 2 m below the surface of clay stratum. What are the pore pressures at 1 m, 2m and 4 m below the water table	4	3	3
2C	A glass cylinder of 40 cm^2 c/s area is provided with a screen at the bottom and is open at the top. Saturated soil sample of height 10 cm is placed at the bottom of a cylinder and is then filled with water upto a height of 100 cm from bottom of soil sample. If the coefficient of permeability of the soil sample is equal to 6.2×10^{-4} cm/sec, evaluate i)the time required to bring the level of water from 100 cm to 70 cm ii) discharge velocity	4	2	3
3A	Water flows through a soil sample of height 100 cm and width 50 cm under a constant head of 90 cm. Draw the flow net and evaluate the seepage. The coefficient of permeability of soil sample is 2.2×10^{-3} cm/sec	3	2	3

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3B	Illustrate i) optimum moisture content and maximum dry unit for compacted soil ii) zero air voids line and 100 % saturation line	3	4	2
3C	Illustrate i) Mohr Coulomb theory ii) Triaxial shear test to determine the value of cohesion and angle of internal friction for the soil	4	5	2
4A	Results obtained from box shear test are as shown in the table. Evaluate the angle of internal friction and cohesion for the soil sample. If similar soil sample fails in triaxial compression strength test at cell pressure of 0.2 N/mm^2, evaluate the axial stress and deviator stress at failure. Size of shear box is 60 mm x60 mm. 	Test no	Normal load(N)	Shear load(N)
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1	360	851
2	540	917		4	5	3
4B	Illustrate unconfined compression strength test to obtain shear strength parameters of soil	2	5	2
4C	i)IIustrate logarithm of time fitting method to determine coefficient of consolidation ii)A soft clay of thickness 4 m lies below a building. The pressure at the center of the clay before the construction of building is 150 kN/m^2 and the increase in pressure due to the construction of building is 400 kN/m^2. If the compression index for the clay stratum is 0.4 and void ratio is 0.92, evaluate the consolidation settlement of the building.	4	4	3
5A	A stratum of normally consolidated clay of thickness 4 m is drained on both the sides. It has coefficient of consolidation of 1.72 mm^2/min. Evaluate the time required for 40 % consolidation. If the drainage is provided only on one side what is the time required for 50% consolidation	4	4	3
5B	Illustrate the variable head permeability test to determine the coefficient of permeability of soil	2	2	2
5C	Evaluate vertical stress at 2 m below ground level at point P for the loaded area as shown in figure due to uniformly distributed load of 100 kN/m^2. 	4	3	3