Ref No.–Ex/PG/CE/T/127C/2019

MASTER OF ENGINEERING INCIVIL ENGINEERINGEXAMINATION, 2019
(1ST YEAR 2ND SEMESTER)

(1st/ 2nd Semester/

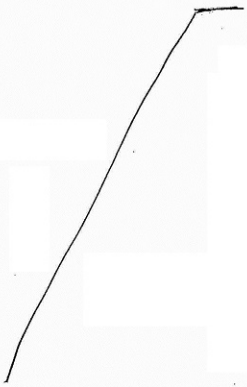
SUBJECT: SOIL DYNAMICS & MACHINE FOUNDATION(SMFE)

(Name in full)

Full Marks 30/100

Time: Three hours/

No. of Questions	PART I (MARKS 30)	Marks
	Answer all questions	
Q1	Discuss the various laboratory and field tests for determining shear modulus and damping of soil. Show graphically typical variation of shear modulus with void ratio and effective confining pressure for both cohesive and cohesionless soils.	6+4 = 10
Q2	Top 10.0m soil at a particular site is overconsolidated clayhaving dry unit weight of 17.5 kN/m^3. Water table is at a depth of 4m below the ground surface. Specific gravity of clay is 2.68. Plasticity index is 40.OCR = 5. Void ratio, e=0.50. Triaxial tests gave the value of $c' = 40kPa$ and $\varphi' = 27^0$. Calculate the magnitude of shear modulus at interval of 2.5m and draw the variation with depth at an appropriate scale. Use the following expressions : Shear modulus $(kN/m^2) = [3350(2.97 - e)^2/(1+e)](OCR)^k(\sigma^0)^{0.5}$ k for PI = 40 is 0.30.	10
Q3	Determine the natural frequency of a pile of length 16m and diameter 500mm made of M30 concrete carrying a vertical load of 900kN. The safe vertical capacity of the pile is 1200kN. During horizontal load test the deflection of pile is 0.80 mm for a lateral load of 30 kN. Take frequency factor = 0.49. Also determine spectral acceleration and displacement of the pile if S_a/g varies from 0.050 to 0.053 for time period range of 2.3sec to 2.2sec.	10



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M.E. CIVIL ENGINEERINGFIRST YEARSECOND SEMESTEREXAM 2019

SOIL DYNAMICS AND MACHINE FOUNDATION (SMFE)

Time: Three hours **Full Marks : 100**

Use a separate Answer-Script for each part

1. Answer ALL questions.
2. Assume reasonable values of data if it is not supplied.
3. No code etc. will be needed to answer the questions of this part
4. Notations used bear their usual meanings

No. of Question — Part –II (35 Marks) — Marks

Q.1 a) Illustrate the difference between 'Weightless Spring Method' and 'Elastic Half Space Approach' 5

b) A reciprocating machine is symmetrically mounted on a block of size 5m x 4m x 4m high and is made of M30 concrete. The soil at the site is normally consolidated silty clay (c_u = 50 kN/m^2 and γ = 20 kN/m^3). Water table is not encountered within 5m depth below ground surface. The block is embedded in ground by 2m from bottom. The machine vibrating at a speed of 350 rpm generates maximum vertical unbalanced force = 4.5 kN. Torque about vertical axis is 4.0 kN-m. Operating speed of machine is 350 rpm. Machine weight is small in comparison to weight of foundation. Limiting amplitude of machine is 150 micron. 10

$c_u = 3.62 \times 10^4$ kN/m^3 and $\mu = 0.45$

Determine natural frequencies and amplitudes for vertical Vibration without embedment effect.

Q.2 a) Show dynamic analysis deducing expressions for frequency and amplitude of vibration for an 'Impact' type machine considering a single degree of freedom system. 4

b) A 25 kN hammer has the following specifications: 6

Supply steam pressure = 800kN/m^2, Area of piston = 0.17m^2, maximum tup stroke = 900mm, Efficiency of drop = 0.65, Total weight of hammer = 450kN, coefficient of elastic restitution = 0.6. Compute the velocity of tup before impact and velocity of anvil after impact.

Q.3 Illustrate, in brief, 'Resonance' or 'Amplitude' Method of analysis in connection with design of a Turbo generator foundation with neat sketches. 10

EX/PG/CE/T/127C/2019

M.E. Civil Engg. EXAMINATION, 2019

(1st Year, 2nd Semester)

SOIL DYNAMICS AND MACHINE FOUNDATION

PART-III

Time: Three Hours

Full Marks 100
(35 marks for this part)

Use a separate Answer-Script for each part

[Answer all the question & Assume data reasonably wherever necessary]

Question No.	(Answer all the questions)	Marks
1.(a)	Derive the equations of motion for a three dimensional elastic solid. Solve the equations for primary or dilatational wave (V_P) and shear or rotational wave (V_S).	[7+6]
(b)	Write a short note on 'Dispersion of surface waves'.	[5]
2.(a)	Define 'rock outcropping' motion.	[2]
(b)	Write down the assumptions involved in 1D ground response analysis.	[3]
(c)	Derive an expression for transfer function for uniform damped soil on rigid rock case. Define characteristic site period.	[10+2]