SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &
Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B Tech IT)
COIMBATORE-641 035, TAMIL NADU

IA 3 Examination
SET 'A'

Institution	SNS College of Technology
Branch	B.E Mechanical Engineering
Semester	VI
Course Code/Name	19MEB303 / Finite Element Analysis
Name of the Faculty	Mr. P.Janagarathinam,AP /Mech

S.No	Quality Parameters basedon blooms	Grade points (g)	Part	No of Questions(n)	Allotted marks (m)	n*m	Q= n*m*g
1	Remember/ Understand (Level - 1,2)	1	A	4	2	8	8
			B				
			C				
2	Apply (Level - 3)	2	A				
			B	1	14	14	28
			C				
3	Analyze (Level - 4)	3	A	1	2	2	6
			B	4 1	13 14	52 14	156 42
			C				
4	Evaluate(Level-5)	4	A				
			B				
			C				
5	Create (Level -6)	5	A				
			B				
			C				
						90	240

Quality Index $Q = \frac{\sum Q}{\sum (n \times m)} = \frac{240}{90} = 2.667$ - High.

P. Janag 3/5/25
Faculty
(P. Janagarathinam, AP/Mech)

Teaching Coordinator
3/5/25

HoD
3/5/25

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Reg. No: | | | | | | | | | | | |

B.E/B.Tech- Internal Assessment – III
Academic Year 2024-2025 (Even Semester)
Sixth Semester
Mechanical Engineering
19MEB303– FINITE ELEMENT ANALYSIS

A

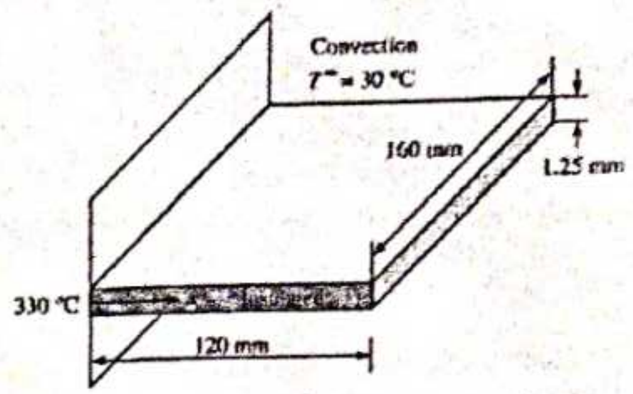
Time: 1 1/2 Hours **Maximum Marks: 50**

Answer All Questions

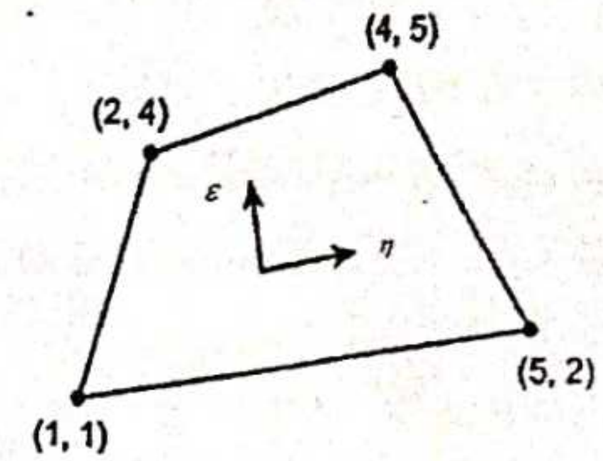
		CO	Blooms
1.	Mention the finite element equation for one dimensional heat conduction with free end convection.	CO4	REM
2.	Write the conduction, convection, and thermal load matrices for one dimensional heat transfer through a fin.	CO4	REM
3.	A metal pipe of 10-cm outer diameter carrying steam passes through a room. The walls and the air in the room are at a temperature of 20°C while the outer surface of the pipe is at a temperature of 250°C. If the heat transfer coefficient for free convection from the pipe to the air is h = 20 W/m2-°C find the rate of heat loss from the pipe. (GATE ME 2022)	CO4	ANA
4.	Differentiate between subparametric, isoparametric and superparametric elements.	CO5	UND
5.	Write down the Gaussian quadrature expression for numerical integration. (GATE ME 2023)	CO5	REM

PART – B (2*13=26 Marks) & (1*14=14 Marks)

			CO	Blooms
6.	(a)	A wall of an industrial oven consists of three different materials, first layer is composed of 6 cm of insulating cement with a clay binder that has a thermal conductivity of 0.06W/m.K. The second layer is made from 16cm of 6-ply asbestos board with a thermal conductivity of 0.064W/m.K. The exterior consists of 11cm common brick with a thermal conductivity of 0.76 W/m².K. The inside wall temperature of oven is 250 °C, and the outside air is 26 °C with a convection coefficient of $40W/m^2.K$. Determine the temperature distribution along the composite wall.	13 CO4	ANA
		(OR)		
	(b)	Determine the steady-state temperature distribution in a thin rectangular fin shown in Figure. The fin is 120 mm long-160 mm wide- and 1.25 mm thick. The inside wall is at a temperature of 330°C. Two side surfaces are insulated, while the top and bottom surfaces as well as the end surface are exposed to the air. The ambient air temperature is 30°C. Assume k = 0.2W/mm/°C and h = 2 x 10-4 W/mm2/°C.	13 CO4	ANA



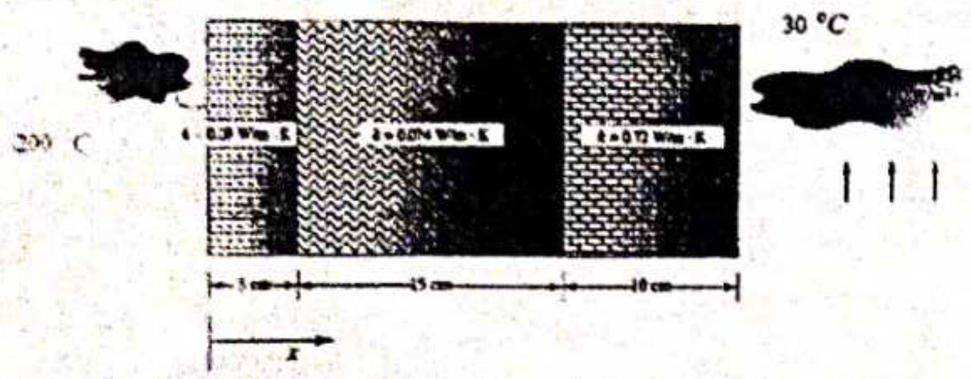
7.	(a)	Establish the strain-displacement matrix for the linear quadrilateral element as shown in figure. at Gauss point $\varepsilon = 0.57735$ *and* $\eta = -0.57735$.	13	CO5	ANA



(OR)

	(b)	(i) Evaluate the integral $\int_{-1}^{1}(x^4-3x+7)dx$ using Gauss integration.	13	CO5	ANA
		(ii) Evaluate the integral $I=\int_{-1}^{+1}\frac{\cos x}{1-x^2}dx$ by applying three point Gaussian quadrature.			
8.	(a)	An industrial furnace uses rods for structural support that also conduct and lose heat by convection. Assuming a 1D heat conduction model with convection from the rod perimeter and an insulated free end, formulate the element stiffness matrix.. (Intel, Tesla)	14	CO4	APP
		(OR)			
	(b)	A wall of an industrial oven consists of three different materials, as depicted in figure 1.0. The first layer is composed of 5cm of insulating cement with a clay binder that has a thermal conductivity of 0.08W/m.C. The second layer is made from 15cm of 6-ply asbestos board with a thermal conductivity of 0.074W/m.C. The exterior consists of 10cm common brick with a thermal conductivity of 0.72W/m2.C. The inside wall temperature of oven is 200 °C, and the outside air is 30 °C with	14	CO4	ANA

a convection coefficient of $40 W/m^2.C$. Determine the temperature distribution along the composite wall. (Saint-Gobain, Thermax, L&T Construction)



Bloom's Taxonomy:
REM – Remember **UND** – Understand **APP**– Apply **ANA**– Analyze **EVA** - Evaluate
CRT - Create

Faculty in-charge	Teaching Coordinator	HoD /Mech
(P. Jayagarathinam AP/Mech)	VK	