AR19

CODE: 19MTE1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech. I Semester Regular Examinations, Jan/February, 2020

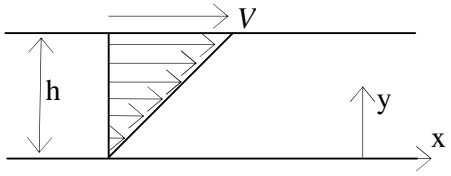
ADVANCED FLUID DYNAMICS
(Thermal Engineering)

Time: 3 Hours **Max Marks:60**

Answer any FIVE questions
All questions carry EQUAL marks

1. a) i) What is the Eulerian description of fluid motion? How does it differ from the Lagrangian description? 6 M
   ii) Is the Lagrangian method of fluid flow analysis more similar to study of a system or a control volume? Explain.
   iii) A tiny neutrally buoyant electronic pressure probe is released into the inlet pipe of a water pump and transmits 2000 pressure readings per second as it passes through the pump. Is this a Lagrangian or an Eulerian measurement? Explain.
   b) i) What is the definition of a 'pathline'? What do pathlines indicate? 6 M
   ii) What is the definition of a 'streamline'? What do streamlines indicate?
   iii) What is the definition of a 'streakline'? How do streaklines differ from streamlines?

2. a) A steady, three-dimensional velocity field is given by 6 M
   $\vec{V} = (u, v, w) = (2.49 + 1.36x - 0.867y)\vec{i} + (1.95x - 1.3y)\vec{j} + (-0.458xy)\vec{k}$
   Calculate the vorticity vector as a function of space variables (x, y, z).
   b) For the Couette flow as shown in figure shown below, calculate the linear strain rates in the x- and y-directions, and calculate the shear strain rate ε_{xy}. 6 M



3. a) Derive Navier stokes equation of motion for steady flow of compressible fluid. 6M
   b) A flat plate 4 m wide and 1 m long (in the direction of flow) is immersed in kerosene at 20^0C ($\nu = 2.29 \times 10^{-6}$ m^2/s, $\rho = 800$ kg/m^3) flowing with an undisturbed velocity of 0.5 m/s. Verify that the *Reynolds* number is less than critical everywhere, so that the flow is laminar. Show that the thickness of the boundary layer at the centre of the plate is δ = 0.74 and at the trailing edge is δ = 1.05 cm. Calculate the total frictional drag on one side of the plate. 6M

4. a) Air flows parallel to a speed limit sign board along the highway at speed V = 8.5 m/s. The temperature of the air is 25^0C, and the width W of the sign board parallel to the flow direction (i.e., its length) is 0.45 m. Is the boundary layer on the sign board laminar or turbulent or transitional? (For air at T = 25^0C, $\rho = 1.184$ kg/m^3 and $\mu = 1.849 \times 10^{-5}$ kg/m.s) 6 M
   b) Consider a turbulent boundary layer on flat plate. Suppose only two things are known: $C_{f,x} \cong 0.059.(\mathrm{Re}_x)^{-1/5}$ and $\theta = 0.097\delta$. Use the Karman integral equation to generate an expression for δ / x. 6 M

5. a) Define the following terms; write down their formulas and units where applicable: 6 M
i) stagnation pressure
ii) stagnation temperature
iii) stagnation velocity of sound
iv) Mach number
v) critical and maximum velocities
vi) transonic and hypersonic flows

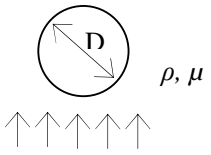
b) A perfect gas flows through a duct with a velocity of 182.33 m/s. The mass flow rate is 0.9072 kg/s. The area of the duct is 0.0516 m^2, and the flow Mach number is 0.5. Calculate the static pressure of the air. Take k = 1.4 and R = 287 J/kgK. 6 M

6. a) i) Is it possible to accelerate a gas to a supersonic velocity in a converging nozzle? Explain. 6 M
ii) Consider a converging nozzle and a converging-diverging nozzle having the same throat areas. For the same inlet conditions, how would you compare the mass flow rates through these two nozzles?

b) Air enters a 12 m long, 5 cm diameter adiabatic duct at V_1 = 70 m/s, T_1 = 500 K, and P_1 = 300 kPa. The average friction factor for the duct is estimated to be 0.023. Determine the Mach number at the duct exit, the exit velocity, and the mass flow rate of air. (Properties of air: k = 1.4, c_p = 1.005 kJ/kg.K, and R = 0.287 kJ/kg.K) 6 M

7. a) Using continuity and Bernoulli equations derive the expressions for the following. Make suitable assumptions and state them. 6 M
i) Flow rate of a gas under adiabatic conditions through a venturimeter
ii) Head loss in a sudden expansion in a pipe

b) A drop of water in a rain cloud has diameter D = 57.5 μm as shown in figure below. The air temperature is 25^0C, and its pressure is standard atmospheric pressure. How fast does the air have to move vertically so that the drop will remain suspended in the air? (For air at T = 25^0C, ρ = 1.184 kg/m^3 and $\mu = 1.849 \times 10^{-5}$ kg/m.s. The density of the water at T = 25^0C is 997.0 kg/m^3) 6 M



8. a) What is Mach number? Why is this parameter so important for the study of flow of compressible fluid? 6 M

b) In an air heating system, heated air at 40^0C and 105 kPa absolute is distributed through a 0.2 m × 0.3 m rectangular duct made of commercial steel at a rate of 0.5 m^3/s. Determine the pressure drop and head loss through a 40 m long section of the duct. (Dynamic viscosity of air $\mu = 1.918 \times 10^{-5}$ kg/m.s, ideal gas constant R = 0.287 kJ/kg.K, roughness of commercial steel pipes ε = 0.000045 m, use Moody chart to find the friction factor) 6 M

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CODE: 19MPE1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech. I Semester Regular Examinations, Jan/February, 2020

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(Power Electronics and Drives)

Time: 3 Hours **Max Marks:60**

Answer any FIVE questions
All questions carry EQUAL marks

1.	a)	Determine the expression for stored magnetic energy with necessary diagram.	6 M
	b)	Compare single and double excited system.	6 M
2.		Explain the $\lambda - i$ characteristics of magnetic system. Also derive expression for co-energy density. Assume the $\lambda - i$ relationship of the magnetic circuit is linear.	12 M
3.	a)	Develop machine model for a d.c. compound motor, with the help of neat schematic diagram and primitive diagram.	6 M
	b)	Derive the power and torque equations for Kron's primitive machine	6 M
4.		From first principles derive the voltage and torque equations of a three-phase symmetrical induction machines.	12 M
5.	a)	What are the commonly used induction machine models? Explain the relative importance of them.	6 M
	b)	Explain the rotor reference frame model of a three phase induction machine.	6 M
6.	a)	Explain the generalized model of three phase induction machine in arbitrary reference frame, stator reference frame and rotor reference frame.	6 M
	b)	Obtain the voltage and torque equations of unsymmetrical 2-phase induction machines.	6 M
7.		From the basic equation, derive the expression for voltages in direct axis, quadrature axis, field current and zero sequence voltage for a synchronous machine.	12 M
8.	a)	From the basic equation, Obtain the dynamic model of switched reluctance motor.	6 M
	b)	Derive the voltage equations of a synchronous machine in rotor reference frame.	6 M

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CODE: 19MVL1002 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech. I Semester Regular Examinations, Jan/February, 2020

DIGITAL SIGNAL AND IMAGE PROCESSING
(VLSI System Design)

Time: 3 Hours **Max Marks:60**

Answer any FIVE questions
All questions carry EQUAL marks

1.	a)	Compute the DFT for the sequence {1,2,0,0,0,2,1,1}. Using radix-2 DIF FFT and radix-2 DIT-FFT algorithm.	6
	b)	Derive the equation to implement a butterfly structure In DITFFT algorithm.	6
2.	a)	Explain the classification of discrete time signals and systems.	8
	b)	Write any six properties of Z- Transforms.	4
3.	a)	Show the relation between frequency response of LP/HP/BP/BR filters and placement of poles and compulsory zeros for linear phase FIR filters.	6
	b)	An IIR digital low pass filter is required to meet the following specifications: Pass band ripple: $\leq$ 0.5 dB; Pass band edge : 1.2 kHz ; Stop band attenuation : $\geq$ 40 dB; Stop band edge : 2.0 kHz; Sample rate : 8.0 kHz Determine the required filter order for a digital Butterworth.	6
4.	a)	Differentiate fixed point representation and floating point representation of coefficients of a filter?	6
	b)	With examples, discuss the fixed point representation of number?	6
5.		Assume you have to process a digital image. List the stepwise process to do the processing. What will be the different tools and components of your image processing system? Explain with the help of an example and diagram.	12
6.		Write notes on the following	
	a)	JPEG-2000	4
	b)	What is difference between JPEG and JPEG2000?	4
	c)	Differences between lossy and lossless compression	4
7.		Explain how gray level and color digital images are represented mathematically and relate their representations. Discuss about color slicing, tone and color corrections.	12
8.		Explain in detail the VLSI architectures for implementing Image Processing Algorithms with the help of a block diagram.	12

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CODE: 19MCS1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech. I Semester Regular Examinations, Jan/February, 2020

ADVANCED ALGORITHMS AND DESIGN
(Computer Science and Engineering)

Time: 3 Hours **Max Marks: 60**

Answer any FIVE questions
All questions carry EQUAL marks

1. a) Explain various Hash Functions in detail
   b) Implement Insertion Sort Technique on the following 20, 6, 89, 32, 65, 92, 8 numbers.

2. a) Explain the advantages of splay tree in representation of dictionaries
   b) Insert appropriately the following numbers into a 2-3 tree in the given order: 9,6,3,8,13,20,4,5,7,11,1,15

3. a) Define Spanning Tree? Discuss and Design steps in Prim's algorithm to construct minimum spanning with an example?
   b) Write the DFS procedure. Explain with an example.

4. a) Describe the Knuth-Pratt algorithm for searching an occurrence of "abracadabra" in abrabracabracadabracadabracad"
   b) Explain about the Bad Character Rule with an example

5. a) Give an example of directed graph and apply Dijkstra's algorithm.
   b) Explain the output of Floyd Warshall's algorithm using a suitable example.

6. a) Given the data n=5, P={11,14,7,9,5}, W={7,6,2,5,3}. Find the optimal solution to the 0/1 Knapsack problem using FIFOBB method.
   b) Express travelling sales person problem with an example

7. a) Write and explain how the Disjoint Set operations "Weighted-Union" and "Collapsing-Find" are more efficient.
   b) Define component graph and write an algorithm to compute the strongly connected components of directed graph?

8. a) What is Patricia? Explain with an example.
   b) Explain the Insert operation in a Binary Search Tree with a suitable example.

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CODE: 19MSE1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech. I Semester Regular Examinations, Jan/February, 2020

ADVANCED SOLID MECHANICS
(Structural Engineering)

Time: 3 Hours **Max Marks:60**

Answer any FIVE questions
All questions carry EQUAL marks

1.		Determine the stress invariants for the following stress system. $\sigma_x = 100MPa, \sigma_y = 50MPa, \sigma_z = 0$ $\tau_{xy} = 100MPa, \tau_{yz} = -50MPa, \tau_{zx} = 0$	12M
2.	a)	What are principal stresses? Discuss	6M
	b)	Explain "transformation of stresses and its need".	6M
3.	a)	Derive expression for Equations of equilibrium in three dimensions?	6M
	b)	Derive the expression for strain at a point in case of a body stressed in three dimensions?	6M
4.		Determine principal stresses and principal strains for the state of stress at a point given below in kg/cm^2 $\tau_{ij} = \begin{matrix} 200 & 30 & 40 \\ 30 & 100 & 20 \\ 40 & 20 & 50 \end{matrix}$	12M
5.	a)	Explain how Airy's stress function is used in polar coordinates?	6M
	b)	Write the expressions for radial, tangential and shear strains in terms of displacements u & v and explain.	6M
6.	a)	Explain Prandtle approach for torsion problems.	5M
	b)	Obtain the expression for maximum shearing stress of a thin walled rectangular section subjected to a torque 'T'.	7M
7.	a)	Discuss the Von Mises yield criterion for failure.	8M
	b)	List out the assumptions in plasticity theory.	4M
8.		Write short notes on following a) Reciprocal theorem b) Generalized Hook's law c) Uniqueness of a solution	12M

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CODE: 16MVL1004 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech. I Semester Supplementary Examinations, Jan / February-2020

DIGITAL IC DESIGN
(VLSI System Design)

Time: 3 Hours Max Marks:60

Answer any FIVE questions
All questions carry EQUAL marks

1.	(a)	Explain how Power and Energy Consumption quantify the quality of IC design	[6M]
	(b)	What is meant by propagation Delay? Explain how this effect performance of a Digital IC.	[6M]
2.	(a)	Discuss about MOS Transistor under Static Condition.	[6M]
	(b)	Explain the Impact of Hot carrier effect on MOS transistor design.	[6M]
3.	(a)	Write about Noise margins of CMOS Inverter.	[6M]
	(b)	Explain how Capacitances Influence the dynamic behaviour of CMOS Inverter.	[6M]
4.	(a)	Compare the Characteristics of TTL, ECL and CMOS logic Families.	[6M]
	(b)	Write Structural model VHDL code for 4 bit Parallel adder.	[6M]
5.	(a)	Draw the ASM Chart for a sequence detector and write a behavioural VHDL code for this circuit.	[6M]
	(b)	Draw and explain the interfacing circuits for converting CMOS logic to TTL logic.	[6M]
6.	(a)	Write a VHDL Code describing any finite state machine as an example.	[6M]
	(b)	Describe the rules for state assignment. Give an example.	[6M]
7.	(a)	Explain the operation of synchronous decade counter with waveforms.	[6M]
	(b)	Write about barrel shifters with respect to digital circuits.	[6M]
8.	(a)	Compare SRAM and DRAM.	[6M]
	(b)	Describe the I/O block architecture of FPGA	[6M]

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