AR13

Code No: 13MTE1007   **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech I Semester Regular / Supplementary Examinations, February–2016

SOLAR ENERGY TECHNOLOGY
(Thermal Engineering)

Time: 3 hours   **Max Marks: 60**

Answer any FIVE questions
All questions carry equal marks

1.	(a)	Explain the importance of solar energy in the current energy scenario in India?	[6M]
	(b)	Derive the expression for average solar radiation on a tilted surface?	[6M]
2.	(a)	Explain about the principle of solar collector system and what are its types?	[6M]
	(b)	Explain the Construction and operation of liquid flat plate collector?	[6M]
3.	(a)	Explain about Heat transport system in a solar water heating system?	[6M]
	(b)	Explain about solar distributed receiver system in a solar water heating system?	[6M]
4.	(a)	Explain about different methods for sensible heat storage using solids and Liquids?	[6M]
	(b)	Explain about the construction and principle of working of packed bed storage?	[6M]
5.	(a)	What are the applications and limitations of latent bed storage?	[6M]
	(b)	Write short notes on Solar Ponds and Solar Refrigeration?	[6M]
6.	(a)	What is the significance of a pn junction in the operation of a PV device? Explain?	[6M]
	(b)	Discuss the effect of illumination intensity and load resistance on the performance of a PV cell.	[6M]
7.		What is payback period and how it is calculated.	[12M]
8.		Explain about the cost based analysis of water heating and photo voltaic applications.	[12M]

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SET2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I M.Tech. I Semester Regular/Supplementary Examinations, February-2016

MODERN CONTROL THEORY
(Power Electronics and Electric Drives)

Time: 3 Hours
Max Marks: 60

Answer any FIVE questions
All questions carry EQUAL marks

1. a) Define and explain state, state variable, trajectory and portrait.
   b) Derive the solution of Non-homogeneous state equations.

2. a) Explain the significance of Jordon canonical approach.
   b) Comment upon controllability and observability of the following state model

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \text{and} C = \begin{bmatrix} 3 & 4 & 1 \end{bmatrix}$$

3. a) Explain in detail about Backlash and Saturationnonlinearities.
   b) Define and explain the significance of equilibrium points.

4. a) draw the phase plane trajectory for the following equation using isocline
   method $\ddot{x} + 2\xi\omega\dot{x} + \omega^2 x = 0$ given $\xi = 0.5$ and $\omega = 1$, initial point $(0, \quad 6)$.
   b) Explain the Isocline method for construction of phase trajectory.

5. a) Explain the Lyapunov global stability theorem.
   b) Determine the stability of the equilibrium state of the following system
   $\dot{x}_1 = 3x_1 + 2x_2$
   $\dot{x}_2 = -x_1 - x_2 - x_2{}^2$ usingLyapunov's method

6. a) consider the non-linear system described by the equation
   $\dot{x}_1 = x_2$

   $$\dot{x}_2 = -x_1{}^2 x_2 - 2x_1{}^2$$

   By using Krasovskii's method, investigate the stability of the system.
   b) Explain the Lyapunov's instability theorem.

7. Linear quadratic regulator problem described by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

and has a performance index $J = \int_0^\infty \left[x^T \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix} x + u^2 \right] dt$ determine the i)
the riccati matrix P (ii) the state feedback matrix K (iii) the closed loop eigen
values.

8. For the transfer function $\frac{Y(s)}{U(s)} = \frac{s^3 + 5s^2 + 6s}{s^4 + 10s^3 + 29s^2 + 20s}$ obtain the state model in (i)
Observable canonical form (ii) Jordon canonical form (iii) Controllable
canonical form

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Answer any FIVE questions
All questions carry equal marks

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1. Discuss the different types of processors that can implement the functionality in Processor Technology. [12M]

2. a) Describe the RT level custom single purpose processor design with example. [6M]
   b) Discuss the Application Specific Instruction Set Processors. [6M]

3. a) Define the following terms 1) Concurrent processes 2) real time systems 3) Concurrent process model. [6M]
   b) Explain Finite State Machine with Data path Model. [6M]

4. a) Briefly describe about UART and RS 232. [8M]
   b) Write about interrupt service mechanism in RTOS. [4M]

5. a) Draw and explain the architecture of the Kernel. [6M]
   b) Explain the need of mail boxes in RTOS based embedded systems. [6M]

6. a) Explain in detail about Semaphores. [6M]
   b) Explain about Message queues and Event registers [6M]

7. a) Explain the memory management organisation of RTOS. [6M]
   b) Explain in detail about the real-time operating systems and Windows CE. [6M]

8. Write short notes on [6M+6M]
   i) Parallel evaluation of compilation and synthesis
   ii) Verification.

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Time: 3 hours   Max Marks: 60

Answer any FIVE questions
All questions carry equal marks

1. a) Write about Multi-programmed batch systems   [7M]
   b) Write about Distributed systems   [5M]

2. a) Briefly write about vi editor   [8M]
   b) Write about tail, head commands with suitable examples   [4M]

3. a) Write about nl, uniq commands with suitable examples   [2+2 M]
   b) Write about control structures   [8M]

4 a) What is a process. Write about various states that a process may undergo, with the
      help of a neat sketch. Write about Process Control Block   [6M]
   b) Write about priority scheduling algorithm.   What is the problem with priority
      scheduling   and also write how to overcome the problem   [6M]

5 a) Explain indetail about paging technique   [6M]
   b) Consider the reference string: 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1.
      How many page faults would occur for the following replacement algorithms for
      memory with 3 frames.
    i) FIFO   ii) Optimal iii) LRU   [2+2+2M]

6 a) Write the solution for Dining Philosophers problem using monitors. [6M]
   b) Write about interrupted system calls   [6M]

7 a) Write about file access methods   [6M]
   b) Write about free space management   [6M]

8 a) Write about semaphore for Mutual Exclusion   [5M]
   b) What is a message queue. Write code to create public message queue. [7M]

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FOUNDATION ENGINEERING
(STRUCTURAL ENGINEERING)

Time : 3 hours   **Max Marks : 60**

Answer any FIVE questions
All questions carry equal marks

1. (a) Describe in brief various geophysical methods. Discuss their uses and limitations   [6M]

    (b) Describe various methods of drilling holes for subsurface investigation   [6M]

2. (a) Discuss various types of samplers for obtaining undisturbed samples   [6M]

    (b) Write brief note on precautions to be taken in transporting undisturbed samples   [6M]

3.   A square column foundation is to be designed for a gross allowable load of 250kN. If the load is inclined at an angle of $15°$ to the vertical, determine the width of foundation. Take factor of safety of 3.0 and use Vesic's equation. Take unit weight of soil $=19$ kN/m^3, c' $=5$ kN/m^2, $\varphi' = 35°$. The depth of the foundation is 1.0m

4. (a) Discuss Meyerhof's Bearing capacity Theory.   [6M]

    (b) Determine the ultimate bearing capacity of a square footing 2m x 2m in a soil   [6M]
         with unit weight of 18 kN/m^3 , c $=20$ kN/m^2, $\varphi' = 20°$. Take the depth of foundation as 1.50m. Use Hansen's equation

5. (a) What do you understand by proportioning of shallow foundations?   [6M]

    (b) What are the different types of raft foundations?   [6M]

6.   Design a pile to carry an allowable load of 85kN. The pile is installed in a site [12M] containing clay of medium consistency with undrained cohesion varying from 30 kN/m^2 to 50 kN/m^2 over a depth of 3m and a uniform undrained cohesion of 50kN/m^2 for further depth. Consider the pile to be cast in-situ concrete pile. Take Factor of safety $= 3$

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7. (a) What is negative skin friction? What is its effect on a pile?   [6M]

    (b) A precast concrete pile is driven with a 30kN drop hammer with free fall of 1.5m.   [6M]
         The average penetration recorded in the last few blows is 5mm per blow.
         Estimate the allowable load on the pile using Engineering News Formula.

8. (a) Discuss the procedure for design of raft foundation   [6M]

    (b) Determine the allowable soil pressure for a raft (10.0 m x 10.0m) if the depth is   [6M]
         5m and the undrained cohesion is 40 kN/m^2. Take factor of safety of 2.5

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