# AR16

**CODE: 16MTE1007** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**

**I M.Tech. I Semester Regular & Supplementary Examinations, February-2018**
**SOLAR ENERGY TECHNOLOGY**
**(Thermal Engineering)**

Time: 3 Hours Max Marks:60

Answer any FIVE questions
All questions carry EQUAL marks

| | | | |
|---|---|---|---|
| 1. | (a) | Explain the measurement instruments (any one) for solar radiation with neat diagram. | 6M |
| | (b) | Estimate the monthly average daily global radiation on a horizontal surface at Vadodara ($22^0$ 00' N, $73^0$ 10' E) during the month of March if the average sunshine hours per day is 9.5. | 6M |
| 2. | | Calculate the overall loss coefficient $U_l$ for the receiver of a cylindrical parabolic concentrating collector system. The receiver consists of a selectively coated absorber tube with one glass cover around it. The following data is given:<br>Absorber tube, inner diameter ($D_i$) : 7.5cm<br>Absorber tube, outer diameter ($D_o$) : 8.1cm<br>Glass cover, inner diameter ($D_{ci}$) : 14.4cm<br>Glass cover, outer diameter ($D_{co}$) : 15.0cm<br>Emissivity of absorber tube surface ($\varepsilon_p$) : 0.15<br>Emissivity of glass ($\varepsilon_c$) : 0.88<br>Mean temperature of absorber tube ($T_{pm}$) : $170^0$ C<br>Ambient temperature ($T_a$) : $25^0$ C<br>Wind speed ($V_\infty$) : 4 m/s | 12M |
| 3. | (a) | Explain the orientation and tracking modes of cylindrical parabolic collector. | 6M |
| | (b) | Calculate the monthly average hourly radiation falling on a flat plate collector facing south ($\Upsilon$ = $0^0$) with a slope of $15^0$ , given the following data<br>Location : Chennai ($13^0$ 00' N)<br>Month : October<br>Time : 11.00 – 12:00 h (LAT)<br>$I_g$ : 2408 kJ/$m^2$-h<br>$I_d$ : 1073 kJ/$m^2$-h<br>Assume ground reflectivity to be 0.2. | 6M |
| 4. | (a) | Explain the medium temperature power generation cycle using cylindrical parabolic concentrating collectors. | 6M |
| | (b) | Write a brief note on heliostats of central receiver collector. | 6M |
| 5. | (a) | Write short note on latent heat storage. | 6M |
| | (b) | Write short note on solar dryers. | 6M |
| 6. | (a) | Write short notes on commercial solar cells. | 6M |
| | (b) | Explain different applications of solar photovoltaic system. | 6M |
| 7. | (a) | Explain the sensible heat storage using packed bed. | 6M |
| | (b) | Write short note on solar pond | 6M |
| 8. | (a) | Derive an expression for cumulative savings and life cycle savings. | 6M |
| | (b) | A wind energy conversion system of capacity 1MW is installed at a cost of Rs 45000000 and connected to the electricity grid. It works at an annual capacity factor of 20%. Assume:<br>a. The electricity board purchases the electrical energy at the rate of Rs 3.00 per kWh and that this price increases by 5% every year.<br>b. 85% of initial cost of Rs 45000000 is financed through a loan borrowed at the rate of 5% to be rapid in equal instalments in 5 years.<br>c. The rate of depreciation is 80% in the first year and the remaining 20% in the second year. The corporate tax rate is 31%.<br>d. No tax saving is allowed on the interest component of the loan repayment.<br>e. The annual operation and maintenance costs in the first year are 2% of the total cost of the system. This expense increases at the rate of 6% every year.<br>Calculate the cumulative cost for 1 year assuming a discount rate of 10%. | 6M |

# AR16

**CODE: 16MPE1005** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**I M.Tech. I Semester Regular & Supplementary Examinations, February-2018**

**MODERN CONTROL THEORY**
**(Power Electronics and Drives)**

Time: 3 Hours Max Marks:60

Answer any FIVE questions
All questions carry EQUAL marks

1. (a) Clearly explain the limitations of the classical control method. [4M]
   Define state, state variables and state space.

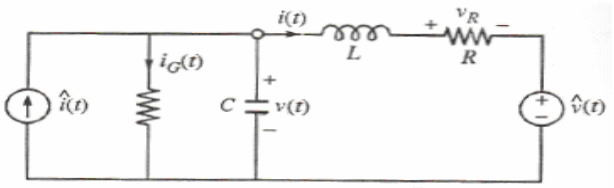
   (b) Consider the system defined by [8M]

   $\dot{x} = Ax$ , $y = Cx$

   where $A = \begin{bmatrix} -1 & 1 \\ 1 & -2 \end{bmatrix}$, $C = [1 \quad 0]$

   Design a full order state observer. The desired eigen values for the observer matrix are $\mu_1 = -5$, $\mu_2 = -5$.

2. (a) Derive the solution of Non- homogenous state equations. [4M]
   (b) Obtain the state model of the electrical network shown in figure by choosing minimum number of state variables [8M]




3. (a) Explain the observability test for continuos time-invariant systems? [4M]

   (b) Consider the system defined by [8M]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{pmatrix} -1 & -2 & -2 \\ 0 & -1 & 1 \\ 1 & 0 & -1 \end{pmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = [1 \quad 1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

   is the system completely state controllable and completely observable?

4. (a) Determine the locations and types of singular points of the non-linear system described by [6M]

$$\dot{x_1} = -0.3 - 0.1\, x_1 + x_2 - 0.188\, x_1^2 - 0.75\, x_2^3$$

$$\dot{x_2} = -0.25\, x_1 - 0.1\, x_2 + 0.047\, x_2^3 + 0.188\, x_1 x_2^2$$

(b) Discuss about the Jump resonance and sub harmonic oscillations in non Linear systems. [6M]

5. (a) Consider a non-linear system described by the equations: [6M]

$$\dot{x_1} = -3x_1 + x_2$$

$$\dot{x_2} = -x_1 - x_2 - x_2^3$$

By using the Krasoviskii method, investigate the stability of the system.

(b) Consider the second order system described by [6M]

$$\begin{bmatrix} \dot{x_1} \\ \dot{x_2} \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

The equilibrium state is the origin. Determine the stability of the system using Lyapunov's method.

6. (a) Draw the phase trajectory of the system described by the equation $\ddot{x}+\dot{x}+x^2=0$. Comment on the stability of the system. [6M]

(b) Construct phase trajectory for the system described by the equation [6M]

$$\frac{d\,x_2}{d\,x_1} = \frac{4x_1+3x_1}{x_1+x_2}$$

Comment on the stability of the system.

7. (a) State stability in the sense of Lyapunov. [4M]

(b) Explain the nonlinearities (i) Saturation (ii) Dead zone [8M]

8. (a) Explain the stability analysis of non linear system by using Describing Functions method [8M]

(b) Define the state? Write down the state equations for dynamic systems. [4M]



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# AR16

**CODE: 16MVL1006** **SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**I M.Tech. I Semester Regular & Supplementary Examinations, February-2018**

**SEMICONDUCTOR DEVICES MODELING**
**(Common to VLSI System Design & DECS)**

Time: 3 Hours Max Marks:60

Answer any FIVE questions
All questions carry EQUAL marks

| | | | |
|---|---|---|---|
| 1. | (a) | Expalin energy band theory in solids | 6 |
| | (b) | What is velocity saturation and how to avoid it? | 6 |
| 2. | (a) | Derive the expression for width of the depletion region? | 6 |
| | (b) | Expalin V-I characteristics of a PN junction diode | 6 |
| 3. | (a) | Draw the energy band diagram of MOS capacitor and explain it? | 6 |
| | (b) | What is strong inversion? | 6 |
| 4. | (a) | Draw and explain the basic DC model of BJT ? | 6 |
| | (b) | Draw and explain the basic AC model of BJT ? | 6 |
| 5. | (a) | What is gradual channel approximation of a MOSFET ? | 6 |
| | (b) | What is sub-threshold region of conduction for a MOSFET ? | 6 |
| 6. | (a) | Discuss the limitations of long channel model? | 6 |
| | (b) | What is quasi static model? | 6 |
| 7. | (a) | Derive the expression for discharge time of a forward biased diode? | 6 |
| | (b) | Distinguish between weak and strong inversions? | 6 |
| 8. | (a) | Derive the expression for short channel threshold voltage? | 6 |
| | (b) | What is velocity overshoot? | 6 |

# AR16

**CODE: 16MCS1005** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**I M.Tech. I Semester Regular & Supplementary Examinations, February- 2018**

**OBJECT ORIENTED PROGRAMMING**
**(Computer Science and Engineering)**

Time: 3 Hours Max Marks:60

Answer any FIVE questions
All questions carry EQUAL marks

| | | | |
|---|---|---|---|
| 1. | (a) | Explain differences between final, finally and finalize. | 6 M |
| | (b) | Write a java program to create a class viz. "Count" with a method to display number of objects created for that class. | 6 M |
| 2. | (a) | What is method overloading and method over riding. Does return type of a method avoids method over loading. Can you overload operators in java. | 6 M |
| | (b) | Explain various access specifiers in java. | 6 M |
| 3. | (a) | Explain methods in "Mouse Motion Listener" interface. | 4 M |
| | (b) | Design a GUI based program using javax. swing package with a text box to enter a three digit number and by pressing the Button "Reverse" the digits in the given number should be reversed and displayed in another text box. | 8 M |
| 4. | (a) | Define Applet. Summarize its features. | 4 M |
| | (b) | Design an applet for passing of parameters | 8 M |
| 5. | (a) | What is "CLASSPATH" and explain its uses. | 4 M |
| | (b) | Write a java program to create and access (using CLASSPATH) the package. | 8 M |
| 6. | (a) | Discuss about I net Address of java.net package and its methods. Define Socket. | 6 M |
| | (b) | Differentiate between String Buffer, String Builder and StringTokenizer. | 6 M |
| 7. | (a) | What is Exception Handling and explain its mechanism with any two Exceptions. | 6 M |
| | (b) | Differentiate between checked and unchecked exceptions and also explain about throws clause. | 6 M |
| 8. | (a) | What is a wrapper class and give some examples. | 6 M |
| | (b) | What is meant by boxing and un boxing? Explain with an example. | 6 M |

# AR16

**CODE: 16MSE1007** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**

**I M.Tech. I Semester Regular & Supplementary Examinations, February-2018**

## OPTIMIZATION IN STRUCTURAL DESIGN
## (Structural Engineering)

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

**Answer any FIVE questions**
**All questions carry EQUAL marks**

1. (a) Enumerate the strength and weakness of optimization approaches.

   (b) Explain the characteristic features of optimization problems.

2. (a) Enumerate the merits of optimization methods. What are their limitations?

   (b) Explain the various classifications of optimization problems.

3. (a) Explain with an example, how optimization problem is based on multi value objective function.

   (b) Using Kuhn-Tucker conditions, find the value of K for which the point $(x^*,y^*) = (1,2)$ will be the optimal to the problem:
   Maximize $f(x,y) = kx-y$
   Subject to $g_1(x,y) = x^2+y^2 \leq 5$ and $g_2(x,y) = x-y \leq 2$.
   Verify your result by using a graphical procedure.

4. State and prove the necessary and sufficient conditions for solving the multivariable unconstrained optimization problems.

5. Compare and contrast the strength and weakness of pattern search methods and gradient methods.

6. (a) Discuss about limitations of Interior penalty function Method

   (b) Use the interior penalty function method to
   maximize $f = -2x_1^2-3x_2^2-x_1-x_2$
   subject to $g(x_1) = 15-3x_1 \leq 0$ and $g(x_2) = -x_2 \leq 0$

7. (a) Discuss the use of Surplus and Artificial variables in Simplex Method

   (b) Maximize $Z= 2x_1-6x_2+4x_3$
   Subject to $3x_1-2x_2+3x_3 \leq 7$
   $-2x_1+4x_2 \leq 12$
   $-4x_1+3x_2+5x_3 \leq 10$
   $x_1, x_2, x_3 \geq 0$

8. (a) Explain about the sequential quadratic programming.

   (b) Discuss about the complementary geometric programming.

# AR13

**Code No: 13MSE1006** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**

**I M.Tech. I Semester Supplementary Examinations, February-2018**

## FOUNDATION ENGINEERING

**(Structural Engineering)**

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

**Answer any FIVE questions**
**All questions carry equal marks**

| | | | |
|---|---|---|---|
| 1. | (a) | Explain the contents of a typical Site Investigation Report? What is Bore log? Show a typical bore log format and its contents. | [7M] |
| | (b) | State the various methods of soil exploration and explain about the Penetration Tests. | [5M] |
| 2. | (a) | Write the comparisons between SPT and CPT | [5M] |
| | (b) | Explain different types of sampling methods used for suitability for tests of soils. | [7M] |
| 3. | (a) | Bring out clearly the effect of ground water table on the safe bearing capacity. | [3M] |
| | (b) | Describe the methods of improving bearing capacity | [4M] |
| | (c) | A strip footing is required to carry a net load of 1000 kN at a depth of 1 m. Taking a factor of safety of 3, determine the width of the footing. Take $\phi = 25^0$, $\gamma = 18$ kN/m$^3$, c = 0 kN/m$^2$. Use Terzaghi's theory. Assume general shear failure (Nc = 37, Nq = 20, N$\gamma$ = 12). | [5M] |
| 4. | (a) | Determine the ultimate bearing capacity of a strip foundation, 1.5m wide with its base at a depth of 1m, resting on a dry sand stratum, take $\gamma$d=17 kN/m$^3$, $\Phi'=38^0$, and c'=0, if the ground water is located (a) at a depth of 0.5m below the ground surface, (b) at a depth of 0.5m below the base of the footing, $\gamma$s=20kN/m$^3$, using Terzaghi theory (Nc = 61.35, Nq = 48.93, N$\gamma$ = 78.03) | [7M] |
| | (b) | Write a brief note on types of failures in shallow foundations. | [5M] |
| 5. | (a) | Explain the concept of negative skin friction in pile groups. | [4M] |
| | (b) | Explain various types of piles and uses of piles | [3M] |
| | (c) | What are the merits and demerits of the load test? | [5M] |
| 6. | (a) | What is the importance and improvement of Generalized bearing capacity theory over the Terzaghis bearing capacity theory | [4M] |
| | (b) | What are different types of deep foundations based on size, shape, cross section, load bearing mechanisms, etc.? | [4M] |
| | (c) | Determine the ultimate bearing capacity of square footing of size 1.2 m if the depth of foundation is 1 m. Take $\Phi = 25^0$, $\gamma$=18 kN/m$^3$ and C=15 kN/m$^2$. Use Vesics equation. (Nc = 22.25, Nq = 21.85, N$\gamma$ = 12.54) | [4M] |

# AR13

**Code No: 13MSE1006** **SET-2**

7. (a) A 30 cm diameter concrete pile is driven in a normally consolidated clay deposit 15m thick. Estimate the safe load. Take Cu = 70 kN/$m^2$ , $\alpha$ = 0.9 and F.S = 2.5. [5M]

   (b) A 600 mm diameter and 12 m long pile is to be installed at a site that is characterized by two sand layers. The top layer is 12 m thick, has a $\gamma_t$ = 20 kN/$m^3$ and a $\phi$ = $30^0$. The bottom layer is 20 m thick, has a $\gamma_t$ = 22 kN/$m^3$ and a $\phi$ = $35^0$. The ground water table is at the ground surface. Determine the ultimate axial capacity of the pile. Use Nq = 20 for $\phi$ = $30^0$ and Nq = 50 for $\phi$ = $35^0$. Take $\delta$ = $\phi$ and K = 1. [7M]

8. A building has to be supported on a R.C. Raft foundation of dimensions 14 m x 21 m. The subsoil is clay which has an average unconfined compressive strength of 0.15 kg/$cm^2$. The pressure on the soil due to the weight of the building and the loads that it will carry will be 14 t/$m^2$ at the base of the raft. If the unit weight of the excavated soil is 1.9 t/$m^{3,}$ at what dept should the bottom of the raft be placed to provide a factor of safety of 3 against shear failure? [12M]



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