

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)****IV B. Tech II Semester Supplementary Examinations, April, 2025****UTILIZATION OF ELECTRICAL ENERGY
(ELECTRICAL AND ELECTRONICS ENGINEERING)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Discuss the terms 'continuous', 'intermittent' and 'variable' loads with 7M
examples.
- b) A delta connected 415 V, 50 H.P., 750 rpm. Squirrel cage motor takes a full load 7M
current of 55 A and has a full load slip of 4.5 percent. The impedance per phase is
2.5 ohms. Determine the starting torque and the starting current taken from the
supply if the motor is started by i) D.O.L. starter; ii) Star – Delta starter; iii) An auto
transformer starter with 70 % tapping

(OR)

2. a) Derive an expression for the temperature rise of an electric machine? state the assumptions 7M
made ?
- b) What is mean by "Individual drive" and "Group drive" explains their relative merits and 7M
demerits?

UNIT-II

3. a) Distinguish in detail between Direct Resistance heating and Indirect resistance 7M
heating.
- b) Explain the basic principle of Induction heating along with the characteristics 7M

(OR)

4. a) Describe with neat sketches various methods of resistance welding. 7M
- b) Compare DC and AC welding sets. 7M

UNIT-III

5. a) State and Explain laws of illumination? 7M
- b) What are various sources of light? Write short notes on incandescent lamps. 7M

(OR)

6. a) What are discharge lamps? Explain 7M
- b) Four lamps 15 m apart are arranged to illuminate a corridor. Each lamp is suspended at a 7M
height of 8 m above the floor level. Each lamp gives 450 CP in all directions below the
horizontal; find the illumination at the second and the third lamp.

UNIT-IV

7. a) Write the requirements of Traction motors? 7M
- b) Explain the Mechanics of train movement? 7M

(OR)

8. a) Derive the expression for crest speed, acceleration and retardation for Trapezoidal speed- 7M
time curves?
- b) The distance between two stops is 1.2 km. A schedule speed of 40 kmph is required to 7M
cover that distance. The stop is of 18-s duration. The values of the acceleration and
retardation are 2 kmph/s and 3 kmph/s, respectively. Then, determine the maximum
speed over the run. Assume a simplified trapezoidal speed–time curve.

UNIT-V

9. a) The average distance between stops on a level section of a railway is 1.25 km. Motor- 7M
coach train weighing 200 tonne has a schedule speed of 30 km/h, the duration of stops
being 30 seconds. The acceleration is 1.9 km/h/s and the braking retardation is 3.2
km/h/s. Train resistance to traction is 45 N/t. Allowance for rotational inertia is 10%.
Calculate the specific energy output in Wh/t-km. Assume a trapezoidal speed/time curve
- b) Explain and derive the necessary relation for the Total Tractive effort for the 7M
propulsion of the train

(OR)

10. a) What are the factors affecting specific energy consumption? 7M
- b) Define the Dead Weight, Accelerating Weight, Adhesive weight, and Coefficient of 7M
adhesion:

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Describe the operation of zero order hold device. 7M
 b) Compare the merits and demerits of digital control systems with analog control systems. 7M

(OR)

2. a) Define sampling and explain the process of sampling. 7M
 b) Illustrate the process of ideal sampling. 7M

UNIT-II

3. a) Find the inverse Z-transform of $F(Z) = \frac{1}{z(z-2)(z-0.1)}$, $F(Z) = \frac{z^2+2z+3}{(z-3)(z-1)}$ 10M
 b) Give the limitations of Z-transform. 4M

(OR)

4. a) Find the pulse transfer function for the following system with unity feedback. $G(s) = \frac{1}{(s+1)(s+2)}$. Assume a sampling switch in the forward path. 7M
 b) State and explain initial value theorem. 7M

UNIT-III

5. a) Write down the rules in Jury stability criterion. 7M
 b) Check the stability of the system with the characteristic equation $z^4 - 1.7z^3 + 1.04z^2 - 0.268z + 0.024 = 0$ 7M

(OR)

6. a) A discrete-data control system is described by the state equation $x(k+1) = A x(k) + B u(k)$ where $A = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0.5 & 0 \\ 1 & 0 & 2 \end{bmatrix}$; $B = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$, Determine the state controllability of the system. 7M
 b) Explain the duality between Controllability and Observability 7M

UNIT-IV

7. a) Solve the following difference equation using the Z- transforms method. $y(k+2)+7y(k+1)+4y(k)=u(k)$; where $y(0)=0$, $y(1)=0$, $T=1\text{sec}$. 8M
 b) Explain the need of state space approach compared to transfer function approach. 6M

(OR)

8. The pulse transfer function of digital control system is given by $G(z) = \frac{10z+3}{(z^2+3z+6)}$ 14M
 Obtain state space representation for the system.

UNIT-V

9. Consider the following system 14M

$$\frac{Y(z)}{X(z)} = \frac{z+1}{(z^2+1.3z+0.4)}$$

Obtain the state space representations of controllable and observable canonical forms.

(OR)

10. a) Obtain the state transition matrix of the following discrete time system 10M
 $X(k+1) = G x(k) + H u(k)$
 $Y(k) = C x(k)$
 Where, $G = \begin{bmatrix} 0 & 1 \\ -2 & -2 \end{bmatrix}$ $H = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $C = [1 \ 0]$
 b) Give the properties of state transition matrix. 4M

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SET-1

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

IV B.Tech II Semester Supplementary Examinations, April, 2025

UNCONVENTIONAL MACHINING PROCESSES

(MECHANICAL ENGINEERING)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) What is the need of Unconventional Machining Processes and Classify them 6M
b) Explain the mechanics of MRR in Ultrasonic Machining process 6M
- (OR)**
2. a) Explain the principle of Ultrasonic Machining process with neat sketch. 6M
b) Briefly discuss USM applications and limitations. 6M

UNIT-II

3. a) Explain principle of WJM Process with Neat sketch 8M
b) Discuss the applications and advantages of AJM Process 4M
- (OR)**
4. a) Write the advantages, limitations and applications of magnetic abrasive finishing 6M
Mention its MRR Parameters
b) Explain the principle of abrasive flow machining Machining process with neat sketch. 6M

UNIT-III

5. a) Explain the Working principle of Electro Chemical Machining with neat sketch. 8M
b) Mention the Process parameters of Electrochemical grinding process 4M
- (OR)**
6. a) Explain the Electrochemical Honing process with neat sketch. 6M
b) Explain the principle of Chemical Machining process 6M

UNIT-IV

7. a) Explain the working principle of WEDM with a neat sketch 6M
b) Outline the functionalities to be considered in the selection of Dielectric fluid and Tool Electrode. 6M
- (OR)**
8. a) Explain the working principle of Electric discharge grinding process with a neat sketch 6M
b) Explain the Mechanics of Metal removal Process of EDM 6M

UNIT-V

9. a) Explain the principle of EBM process with suitable sketch 6M
b) Distinguish between the Electron Beam Machining and Laser Beam Machining 6M
- (OR)**
10. a) Describe the principle of PAM process 6M
b) Explain the MRR mechanism and limitations of PAM process 6M