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COLLEGE OF ENGINEERING AND TECHNOLOGY

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VALUE ADDED COURSES
2021-2022
Department of Mechanical Engineering
21ME01- Optimization in Engineering Design

MARK SHEET

Sl. No	Register Number	Student Name	MARKS
1	18TB1201	AJAY.D	96
2	18TB1202	AMEENUL ISLAM.N	84
3	18TB1204	DHAYANITHI.A	96
4	18TB1206	EZHILARASAN.S	92
5	18TB1207	GANESH.M	88
6	18TB1208	GNANASEKAR.S	92
7	18TB1209	KARTHIKEYAN.S	84
8	18TB1210	KIRAN.K	96
9	18TB1211	KOWS.R	84
10	18TB1212	MOHAMED IRSHATH.R	88
11	18TB1213	SARANVEL.M	96
12	18TB1214	SELVAGANAPATHY.T	92
13	18TB1215	SIVA.A	88
14	18TB1216	SIVARAJ.K	96
15	18TB1217	SIVASANKARAN.K	92
16	18TB1218	VUBALANKA SAI VENKATA SRIRAM	88

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Puducherry - 605 110

17	18TBL087	GOKULAKRISHNAN.S	84

HOD

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Puducherry - 605 110

VALUE ADDED COURSES
2021-2022
Department of Mechanical Engineering

21ME01- Optimization in Engineering Design

NAME:

CLASS:

DATE:

1. Each optimization problem must have certain parameters called

   (a) linear variables
   (b) nonlinear variables
   (c) design variables
   (d) dummy variables

   Answer: Option **(c)**

2. When the optimization problem cost functions are differentiable, the problem is referred to as

   (a) rough
   (b) nonsmooth
   (c) smooth
   (d) nonrough

   Answer: Option **(c)**

3. The feasible region for the inequality constraints with respect to equality constraints

   (a) increases
   (b) decreases

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(c) does not change

(d) none of the mentioned

Answer: Option **(a)**

4. The degrees of freedom for an optimization problem that has four design variables is

(a) 1/4

(b) 4

(c) 2

(d) 1

Answer: Option **(b)**

5. All design optimization problems have only linear inequality constraints.

(a) True

(b) False

Answer: Option **(b)**

6. The design optimization problem is infeasible when it meets all requirements.

(a) True

(b) False

Answer: Option **(b)**

7. All design variables should be independent of each other.

(a) True

(b) False

Answer: Option **(a)**

8. A feasible design may violate equality constraints.

(a) True

(b) False

Answer: Option **(b)**

9. The inputs of engineering models include design variables and material properties.

(a) True

(b) False

Answer: Option **(a)**

10. The feasible region for an equality constraint is a subset of that for the same constraint

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expressed as an inequality.

(a) True
(b) False

Answer: Option **(a)**

11. The feasible region usually expands when more constraints are added to the design model and shrinks v

(a) True
(b) False

Answer: option **(b)**

12. The technique for selecting a new point depends upon _____.

(a) scope of the problem
(b) nature of the problem
(c) range of the problem
(d) analysis of the problem

Answer: Option **(b)**

13. In linear programming, the solution is based on _____.

(a) tensile properties
(b) strain properties
(c) elementary properties
(d) shear properties

Answer: Option (**C**)

14.A linear function in three-dimensional space is a _____.

(a) midpoint
(b) plane
(c) laminar
(d) zero

Answer: Option **(b)**

15. One of the most powerful techniques for solving non-linear programming is to transform the _____

(a) data

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(b) problems
(c) materials
(d) labour

Answer: Option **(b)**

16. In non-linear programming the boundaries of the contours of the function are _____.

(a) parallel line
(b) zig-zag lines
(c) trapezoidal lines
(d) straight lines

Answer: Option **(d)**

17. What is linear programming?

(a)Constrained optimization technique
(b)Technique for economic allocation of limited resources
(c)Mathematical technique
(d)All of the mentioned

18. Constraint in a linear programming model restricts.

(a) Value of objective function
(b) Value of a decision variable
(c) Use of the available resources
(d) All of the mentioned

Answer: Option **(d)**

19. The distinguishing feature of a linear programming model is_____.

(a) relationship among all variables is linear
(b) it has a single objective function & constraints
(c) value of decision variables is non-negative
(d) all of the mentioned

Answer: Option **(a)**

20. While solving a Linear Programing model graphically, the area bounded by the constraints is called

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(a) feasible region
(b) infeasible region
(c) unbounded solution
(d) nonbounded solution

Answer: Option **(a)**

21. While plotting constraints on a graph paper terminal points on both the axes are connected by a s

(a) the resources are limited in supply
(b) the objective function is a linear function
(c) the constraints are linear equation or inequalities
(d) all of the mentioned

Answer: Option **(c)**

22. If two constraints do not intersect in the positive quadrant of the graph then

(a) the solution is unbounded
(b) the problem is infeasible
(c) one of the constraints is redundant
(d) none of the mentioned

Answer: Option **(b)**

23. Alternative solutions exist of a Linear Programing model when

(a) one of the constraints is redundant
(b) objective functions equation is parallel to one of the constraints
(c) two constraints are parallel
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Answer: Option **(b)**

24. If a non-redundant constraint is removed from a Linear Programing problem then

(a) the feasible region will become larger
(b) the feasible region will become smaller
(c) the solution will become infeasible.

(d) none of the mentioned

Answer: Option **(a)**

25. The best use of linear programming technique is to find the optimal use of _____.

(a) money

(b) manpower

(c) machine

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Answer: Option **(d)**

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VALUE ADDED COURSES
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Department of Mechanical Engineering

21ME01- Optimization in Engineering Design

NAME: IC/RAN.K

CLASS: IV/MECH

DATE: 20/08/2021

24/25 96%

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(a) True
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Certificate of Completion

2021-2022

This is to certify that Mr/Ms KIRAN. K

Year IV Department MECH has successfully Completed the Value added course.

SCORE: 96

COURSE TITLE: OPTIMIZATION IN ENGINEERING DESIGN

COURSE DURATION: (9-8-21 to 13-8-21)

HOD

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VALUE ADDED COURSES

2021-2022

Department of Mechanical Engineering

21ME02- Energy Storage Technology

MARK SHEET

Sl. No	Register Number	Student Name	MARKS
1	19TB1201	ABDUL AJEES.M	96
2	19TB1202	ARUNESHWAR. J	84
3	19TB1203	DEVA. R	96
4	19TB1205	MOHANDOSS. A	92
5	19TB1206	NANTHAKUMAR. S	84
6	19TB1207	NARAYANA MOORTHI.S	96
7	19TB1208	PONNAMBALAM. E	92
8	19TB1209	PRADEEPRAJ.R	96
9	19TB1211	SILAMBU KALIDASAN. M	84
10	19TB1212	VASANTHARAJ. R	96
11	19TBL055	GOUTHAM.N	92

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VALUE ADDED COURSES

2021-2022

Department of Mechanical Engineering

21ME02- Energy Storage Technology

NAME:

CLASS:

DATE:

1. Which of the following storage method has working similar to the cycle of a Gas turbine Power plant?
Option A: SMES
Option B: Flywheel
Option C: Pumped Hydroelectric
Option D: Compressed Air Energy Storage

2. Which of the following is not used as storage material for sensible TES system?
Option A: Rock
Option B: Reinforced Concrete
Option C: Ice
Option D: Mineral oil

3. What are the factors that determine the amount of energy stored in sensible TES system?

Option A: Volume, temperature and specific heat capacity of storage material
Option B: mass, temperature and specific heat capacity of storage material
Option C: mass, change in temperature and specific heat capacity of storage material
Option D: Volume, change in temperature and specific heat capacity of storage material

4. How the energy stored in the rotor of Flywheel energy storage technology is generally increased?
Option A: Increasing the Angular speed of the rotor
Option B: Decreasing the Mass of the rotor
Option C: Increasing the volume of the rotor

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Option D: Increasing the Specific resistance of the rotor

5. Which of the storage technology involves storing energy in the form of increase in internal energy of the material during isothermal phase change?
Option A: Pumped Hydroelectric energy storage
Option B: Sensible Thermal Energy storage
Option C: Latent Thermal Energy storage
Option D: Compressed Air Energy storage

6. The maximum amount of work (also called availability) that can be produced by a stream of matter or energy (heat, work, etc.) as it comes to equilibrium with a reference environment is defined as –
Option A: Energy
Option B: Enthalpy
Option C: Exergy
Option D: Entropy

7. Which of the following battery parameter is important in determining the range in an Electric Vehicle? Option A: Specific Power
Option B: Volumetric Energy density
Option C: Gravimetric Energy density
Option D: Cycle Life

8._____ can be defined as the amount of stored energy relative to the total energy storage capacity of the battery Option
Option A: State of Charge
Option B: Depth of Discharge
Option C: Self discharge
Option D: Specific Energy

9. Determine the energy stored in a Capacitor of capacitance 1500 uF and charge across its plates is 0.2 C?
Option A: 133 J
Option B: 1333 J
Option C: 0.13 J

Option D: 13.3 J

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10. Which of the following fuel cells has a high operating temperature (around 650 °C) and electrolyte is molten potassium lithium carbonate?
Option A: Alkaline Fuel Cells
Option B: Proton Exchange Membrane fuel Cell
Option C: Direct Methanol Fuel Cell
Option D: Molten Carbonate Fuel Cell

11. What is typically the value of specific energy density of Lithium Ion batteries?
Option A: 35 to 40 Wh/kg
Option B: 150 to 200 Wh/kg
Option C: 300 to 500 Wh/kg
Option D: 10 to 20 Wh/kg

12. Which of the following is a limitation of Super-capacitors?
Option A: Low energy density than capacitors
Option B: Low cell voltage
Option C: Limited charge discharge cycles
Option D: Long recharge times

13. What among the following results in high capacitance of EDLC type super capacitors?
Option A: Both faradic and non-faradic reactions take place at the electrodes
Option B: High cell voltage
Option C: Electric double layer formation at the electrode and electrolyte interface
Option D: Fast charging and discharging

14. Which of the following electrochemical reaction takes place at the positive electrode of a Lead acid battery at the time of discharging?
Option A: $Pb + HSO4^- \rightarrow PbSO4 + H^+ + 2e^-$
Option B: $PbO2 + 3H^+ + HSO4^- + 2e^- \rightarrow PbSO4 + 2H2O$
Option C: $LiCoO2 \rightarrow Li1\text{-}xCoO2 + xLi^+ + xe$
Option D: $NiOOH + H2O + e^- \rightarrow Ni(OH)2 + OH$

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15 .Which of the following Energy storage technology has highest energy density?
Option A: Lead acid battery
Option B: Nickel metal hydride battery
Option C: Lithium ion battery
Option D: Vanadium redox flow battery

16. Which of the following parameters of a battery defines the rate of energy output from the battery for any given application?
Option A: Specific energy
Option B: Specific power
Option C: Energy density
Option D: State of charge

17. Why salt is added in a Solar pond with concentration increasing towards the depth?
Option A: To increase dissipation of suns heat from the surface
Option B: To purify water in the solar pond
Option C: To prevent rising of hot water to the surface
Option D: To make water clear and transparent

18. What is the purpose of using superconducting materials for SMES systems?
Option A: Increase strength of magnetic field
Option B: Reduce the I2R losses in the material
Option C: Reduce the resistance at high temperatures
Option D: Increase permeability of the material

19. _____ of cold material, which is tapped during the day to provide cooling capacity.
Option A: Sensible TES
Option B: Solar ponds
Option C: Seasonal TES
Option D: CTES

20. _____ stores energy in the form of rotational kinetic energy.
Option A: Pumped hydro storage system
Option B: Compressed Air energy storage
Option C: Flywheel
Option D: SMES

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21. _____ is the technology for transferring the electricity stored in electric vehicle (EV) batteries to the grid, buildings, houses, and other energy-consuming destinations.
Option A: G2V
Option B: V2G
Option C: V2H
Option D: V2X

22. The cell voltage of Lithium ion batteries is typically in the range of –
Option A: 1.3 to 1.6 V
Option B: 2.3 to 2.7 V
Option C: 1.8 to 2.1 V
Option D: 3.6 to 4.1 V

23. The energy density (Wh/L) of Vanadium redox flow batteries is in the range of –
Option A: 20-70
Option B: 100-250
Option C: 0.1 - 2
Option D: 1000 - 1500

24 .The operating temperature of which of the following fuel cell types is very high typically 900 – 1000 deg C
Option A: Proton exchange membrane fuel cells
Option B: Solid oxide Fuel cells
Option C: Alkaline Fuel cells
Option D: Direct Methanol fuel cells

25 The method of battery charging in which a constant voltage lower than maximum battery voltage is applied to battery continuously to maintain it at 100 % SOC for emergency power back up is called as –

Option A: Constant voltage charging
Option B: Pulse charging
Option C: Reflex charging
Option D: Float charging

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VALUE ADDED COURSES

2021-2022

Department of Mechanical Engineering

21ME02- Energy Storage Technology

NAME: ABDULAJEES.M

CLASS: III / MECH

DATE: 20/08/2021

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24/25 96 %

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Option C: Energy density
Option D: State of charge

17. Why salt is added in a Solar pond with concentration increasing towards the depth?
Option A: To increase dissipation of suns heat from the surface
Option B: To purify water in the solar pond
Option C: To prevent rising of hot water to the surface
Option D: To make water clear and transparent

18. What is the purpose of using superconducting materials for SMES systems?
Option A: Increase strength of magnetic field
Option B: Reduce the I2R losses in the material
Option C: Reduce the resistance at high temperatures
Option D: Increase permeability of the material

19. _____ of cold material, which is tapped during the day to provide cooling capacity.
Option A: Sensible TES
Option B: Solar ponds
Option C: Seasonal TES
Option D: CTES

20. _____ stores energy in the form of rotational kinetic energy.
Option A: Pumped hydro storage system
Option B: Compressed Air energy storage
Option C: Flywheel
Option D: SMES

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21. _____ is the technology for transferring the electricity stored in electric vehicle (EV) batteries to the grid, buildings, houses, and other energy-consuming destinations.

Option A: G2V
Option B: V2G
Option C: V2H
Option D: V2X

22. The cell voltage of Lithium ion batteries is typically in the range of –

Option A: 1.3 to 1.6 V
Option B: 2.3 to 2.7 V
Option C: 1.8 to 2.1 V
Option D: 3.6 to 4.1 V

23. The energy density (Wh/L) of Vanadium redox flow batteries is in the range of –

Option A: 20-70
Option B: 100-250
Option C: 0.1 - 2
Option D: 1000 - 1500

24 .The operating temperature of which of the following fuel cell types is very high typically 900 – 1000 deg C

Option A: Proton exchange membrane fuel cells
Option B: Solid oxide Fuel cells
Option C: Alkaline Fuel cells
Option D: Direct Methanol fuel cells

25 The method of battery charging in which a constant voltage lower than maximum battery voltage is applied to battery continuously to maintain it at 100 % SOC for emergency power back up is called as –

Option A: Constant voltage charging
Option B: Pulse charging
Option C: Reflex charging
Option D: Float charging

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2021-2022

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Year...III... Department...MECH... has successfully Completed the Value added course.

SCORE: .....96.....

COURSE TITLE: ENERGY STORAGE TECHNOLOGY

COURSE DURATION: 9-8-21 to 13-8-21

HOD

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VALUE ADDED COURSES
2021-2022
Department of Mechanical Engineering
21ME03- Waste to Energy Conversion Techniques
MARK SHEET

Sl. No	Register Number	Student Name	MARKS
1	20TB0301	ABINESH.A	96
2	20TB0302	AMARESH.V	92
3	20TB0303	HARISUDHAN.D	88
4	20TB0304	KAPILDEV.S	84
5	20TB0305	RAJENDIRAN.P	84
6	20TB0306	SURESH KUMAR.R	88
7	20TBL175	HARIHARAN V	92
8	20TBL176	JEROSIN.D	96
9	20TBL177	KISHORE.K	88
10	20TBL178	MADHAVAN.G.K	92
11	20TBL180	PRAVIN.I	96
12	20TBL181	RAGHUL RAJ.K	84
13	20TBL182	RITHEESH KUMAR.R	84
14	20TBL183	THAMIZH ELAKIYAN.S	84

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VALUE ADDED COURSES

2021-2022

Department of Mechanical Engineering

21ME03- Waste to Energy Conversion Techniques

NAME:

CLASS:

DATE:

1. Energy can be recovered from all types of wastes.

a) True
b) False

Answer: b

2. Energy recovery is typically via production of _____

a) Gas
b) Heat
c) Light
d) Steam

Answer: d

3. What is the maximum percent of energy recovered if the steam is condensed before reintroduced to system?

a) 25
b) 35
c) 45
d) 55

Answer: b

4. Energy recovery percentage depends on the type of waste.

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a) True
b) False

Answer: b

5. Which of the following industrial process uses waste as a fuel?

a) Cement kilns
b) Lead manufacturing
c) Acid manufacturing
d) Sulphur manufacturing

Answer: a

6. What is the combustion temperature range in cement kiln incineration?

a) 1300-1600
b) 1350-1650
c) 1250-1450
d) 1235-1600

Answer: b

7. Non-volatile heavy metals in kiln are fixed into _____

a) Clinker's crystalline structure
b) Fumes
c) Solid lump
d) Slag

Answer: a

8. Which of the following waste types are not suitable for co-combustion in cement kilns?

a) Chlorine
b) Hydrogen
c) Calcium

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d) Carbonate

Answer: a

9. What are the two main products of anaerobic digestion?

a) Biogas and bio-fertilizer
b) Waste water
c) Producer gas
d) Syngas

Answer: a

10. Which of the following organic compounds are present in biogas?

a) Butane gas and carbon dioxide
b) Methane gas and carbon dioxide
c) Nitrogen
d) Sodium

Answer: b

11. Which of the following are considered as contaminant gases in biogas?

a) Chlorine
b) Fluorine
c) Nitrogen, hydrogen and carbon monoxide
d) Methane gas and carbon dioxide

Answer: c

12. Which of the following products of anaerobic digestion consists of organic humus and nutrients?

a) Biogas
b) Chlorine
c) Top soil
d) Bio-fertilizer

Answer: d

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13. Which of the following are used to store manure?

a) Silos and cellars
b) Plastic bottles
c) Glass bottles
d) Tin cans

Answer: a

14. What are the three methods of pre-treatment of influent for anaerobic digestion?

a) Galvanization, pyrolysis and pre-heating
b) Mechanical treatment, pre-heating and thermal treatment
c) Galvanization, pyrolysis and thermal treatment
d) Pyrolysis, thermal treatment and pre-heating

Answer: b

15. Thermo-chemical processes have higher efficiencies than bio-chemical processes.

a) True
b) False

Answer: a

16. Which of the following is best suited to decompose lignin?

a) Anerobic digestion
b) Fermentation
c) Thermo-chemical conversion techniques
d) Bio-chemical conversion techniques

Answer: c

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17. Which of the following are types of pyrolysis?

a) Flash and ablative
b) Intermediate and anaerobic digestion
c) Anaerobic digestion and fermentation
d) Fermentation and intermediate

Answer: a

18. Bio-oil has double the heating value of conventional fuel oil.

a) True
b) False

Answer: b

19. What are the three types of hydrothermal processing of biomass?

a) Hydrothermal liquefaction, hydrothermal gasification and ablate pyrolysis
b) Hydrothermal liquefaction, hydrothermal gasification and fast pyrolysis
c) Hydrothermal liquefaction, hydrothermal gasification and hydrothermal carbonisation
d) Intermediate pyrolysis, hydrothermal gasification and ablate pyrolysis

Answer: c

20. Which of the following is the mildest hydrothermal process?

a) Hydrothermal gasification
b) Hydrothermal liquefaction
c) Ablate
d) Hydrothermal carbonisation

Answer: d

21. Which of the following hydrothermal processes produces syngas?

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d) Hydrothermal carbonisation

Answer: a

22. Hydrothermal liquefaction produces _____
a) syngas
b) bio-crude
c) bio-oil
d) producer gas

Answer: c

23. Which of the following produces a solid hydro-char?

a) Catalytic liquefaction
b) Carbonisation
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Answer: d

24. Which of the following technologies are used to convert biomass into useful energy forms?
a) Bio-chemical process
b) Galvanization
c) Doping
d) Photoelectric effect

Answer: a

25. What are the four main types of thermo-chemical processes?

a) Galvanization, photovoltaic effect, chemo-mechanical effect, pyrolysis
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Answer: b

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VALUE ADDED COURSES

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Department of Mechanical Engineering

21ME03- Waste to Energy Conversion Techniques

NAME: AMARESH.V

CLASS: II/MECH

DATE: 20/08/2021

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23/25

92%

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SCORE: ..96.....

COURSE TITLE: ..WASTE TO ENERGY CONVERSION TECHNIQUES.....

COURSE DURATION: (9-8-21 to 13-8-21)

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