b.	Explain about active LTES system.	10	3	3	1,7
29. a.	Explain about chemical energy storage materials and methods.	10	3	4	1,7
	(OR)				
b.	Explain the criteria for the selection of geometry heat exchanger and container design for LTES.	10	3	4	1,7
30. a.	Explain about the cool storage concept and comparison of cold storage technologies.	10	3	5	1,7
	(OR)				
b.	Explain about solar power plant application for TES.	10	3	5	1,7

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Reg. No.														

B.Tech. DEGREE EXAMINATION, MAY 2022

Sixth and Seventh Semester

18MEE445T – THERMAL ENERGY STORAGE SYSTEMS

(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours Max. Marks: 75

	Marks	BL	CO	PO

PART – A (25 × 1 = 25 Marks)

Answer **ALL** Questions

1. Which material is most suitable for sensible thermal energy storage system? 1 1 1 1,2,3

(A) Water (B) Paraffin

(C) Magnesium Chloride Hexahydrate (D) Sodium nitrate

2. The operation temperature range for cold thermal energy storage system is 1 1 1 1

(A) Below 10°C (B) 20°C - 100°C

(C) 100°C - 250°C (D) Above 250°C

3. The amount of energy stored in the brick can be calculated by 1 1 1 1

(A) $Q = m.h\ \delta g$ (B) $Q = m.c_p.\Delta T$

(C) $Q = \Delta U + W$ (D) $Q = hA\Delta T$

4. Choose the correct range of specific heat (J/kg K), (high to low) for the sensible material. 1 2 1 1

(A) Water > wood > clay > steel (B) Steel > clay > water > wood

(C) steel > clay > wood > water (D) clay > wood > steel > water

5. The draw back of using water as sensible heat storage. 1 2 1 1

(A) Low specific heat (B) High density

(C) Limited temperature range (0-100°C) (D) Low thermal conductivity

6. Long term seasonal energy storage system operates with 1 1 2 2

(A) Higher temperature and higher capacity (B) Higher temperature and lower capacity

(C) Lower temperature and lower capacity (D) Lower temperature and higher capacity

7. The salt solution yielded an average temperature of 55°C and provide better thermal storage performance compared to other salt materials. 1 1 2 1

(A) Ammonium nitrate (B) Sodium carbonate

(C) Sodium chloride (D) Potassium nitrate

8. The device which is used in active solar heating storage system — 1 1 2 1
   (A) Turbine (B) Pump
   (C) Compressor (D) Condenser

9. The advantageous character of solid sensible thermal energy storage system is — 1 1 2 1
   (A) High specific heat capacity (B) Reduce risk related to the leakage of the heat storage material
   (C) High energy density (D) Stratification

10. Thermo system (passive) solar heating storage system works due to the — 1 1 2 1
   (A) Pressure gradients (B) Salinity gradients
   (C) Density gradients (D) Concentration gradients

11. The major advantage in organic PCM is — 1 1 3 1
   (A) Readily available (B) High latent heat
   (C) Very expensive (D) Low thermal conductivity

12. To determine the stability of encapsulant materials, PCMs are subject to — 1 1 3 1
   (A) Super cooling (B) Nucleation
   (C) Thermal cycling (D) Compatibility

13. The advantages of latent heat storage system is its — 1 1 3 1
   (A) Efficiency (B) Simplicity
   (C) Size (D) Cost

14. The major drawback of organic PCM is its — 1 1 3 1
   (A) Availability (B) Low thermal conductivity
   (C) Expensive (D) Latent heat

15. The preferred geometry of encapsulation of PCM which provide sufficient void volume without any supporting device is — 1 1 1 2 3 7 1
   (A) Rectangle (B) Cylinder
   (C) Sphere (D) Ellipse

16. Thermal conductivity enhancement in PCM leads to — 1 1 1 4
   (A) Increases in heat transfer rate (B) Decreases in heat transfer rate
   (C) Constant heat transfer rate (D) Transient heat transfer rate

17. Thermal conductivity ratio of water between its solid and liquid state is — 1 1 1 1
   (A) Eight (B) Four
   (C) Three (D) Two

18. The melting temperature of the PCM suitable for solar domestic hot water system lies in the range of — 1 1 1 4
   (A) 25 – 30°C (B) 40 - 60°C
   (C) 60 - 95°C (D) 100 - 175°C

19. DSC is sued for measuring. — 1 1 1,7 4
   (A) Physical property (B) Kinetic property
   (C) Chemical property (D) Thermal property

20. The phenomenon of capturing a gas or a vapour by a substance existing in the condensed state is known as — 1 1 1,7 4
   (A) Adsorption (B) Absorption
   (C) Sorbent (D) Sorpent

21. The device which is employed for producing chilled water — 1 1 1 5
   (A) Fan (B) Proheat coil
   (C) Chiller (D) Cooling coil

22. To produce a thicker layer of Ice, the charging temperature is maintained between — 1 1 1 5
   (A) -7 and -3°C (B) -12 and -9°C
   (C) 7 and 3°C (D) 12 and 9°C

23. Typical heat losses through crack in walls, windows and door from a conventional house is about — 1 1 1 5
   (A) 5% (B) 17%
   (C) 38% (D) 20%

24. East facing rooms are suitable for — 1 1 1 5
   (A) Bedroom (B) Receiving good passive solar gain in winter
   (C) Receiving goods afternoon daylight (D) Bathroom.

25. MWCNT is added to PCM to increase its — 1 1 1 5
   (A) Latent heat (B) Super cooling
   (C) Specific heat (D) Thermal conductivity

PART – B (5 × 10 = 50 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
26. a.	Explain about the mechanical storage system (i) Hydro storage system (ii) Compressed air storage system (iii) Flywheel	4 3 3	3	1	1,7
	(OR)				
b.	Explain about the seasonal thermal energy storage technologies.	10	3	1	1,7
27. a.	Explain the following STES systems with neat sketch (i) Rock bed thermal energy storage system (ii) Solar Pond	5 5	2 2	2 2	1,7
	(OR)				
b.	Explain active solar energy TES for water heating application with a neat sketch.	10	2	2	1,7
28. a.	Explain briefly about encapsulation technique of LTES materials.	10	3	3	1,7
	(OR)				