29. a.	Explain various thermal conductivity enhancement techniques used in energy storage.	10	3	4	1
	(OR)				
b.	Explain in detail about the classification of PCM and discuss the desirable thermal, physical, kinematic and economic properties of PCM.	10	3	4	1
30. a.	Explain cold thermal energy storage system with a neat sketch.	10	2	5	1
	(OR)				
b.	Explain the concentration solar power with thermal energy storage.	10	2	5	7

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Reg. No.														

B.Tech. DEGREE EXAMINATION, NOVEMBER 2022
Sixth and Seventh Semester

18MEE445T – TEHRMAL 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

PART – A (25 × 1 = 25 Marks)
Answer **ALL** Questions

		Marks	BL	CO	PO
1.	Thermal gradient across a storage tank is called (A) Thermal stratification (B) Thermal energy (C) Thermal barrier (D) Thermal strain energy	1	1	1	1
2.	A pure substance would freeze or solidify at its (A) Boiling point (B) Condensation point (C) Melting point (D) Sublimation point	1	1	1	1
3.	Long term seasonal TES systems store heat at _____ temperature below 80°C and require _____ capacity. (A) Low, very small (B) High, very small (C) Low, very large (D) High, very large	1	1	1	1
4.	Rocks and ceramics have a low specific heat of (A) 4.18 kJ/kg.K (B) 1.12 kJ/kg.K (C) 0.84 kJ/kg.K (D) 2.6 kJ/kg.K	1	2	1	1
5.	Which of the following is a type of TES system? (A) Fly wheel (B) Compressed air energy storage (C) Electrical battery (D) Bore hole	1	1	1	1
6.	_____ is employed as the heat carrier fluid in acquifer. (A) Distilled water (B) Ground water (C) Rain water (D) Sea water	1	1	2	1
7.	In which system ground is excavated and drilled to insert vertical or horizontal tube. (A) Water tank storage (B) Aquifer storage (C) Rockbed storage (D) Under ground storage	1	2	2	1
8.	The charging of cold storage systems during the night time is more efficient due to (A) Lower ambient temperature (B) Lower ambient pressure (C) High energy traffic (D) High efficiency of compressor	1	2	2	1

9.	What is the type of heat storage in chilled water storage systems?			1	2	2	1
	(A) Latent heat	(B) Sensible heat					
	(C) Chemical energy	(D) Cryogenic					
10.	Long term seasonal TES systems store heat at _____ temperature.			1	1	2	1
	(A) Low	(B) High					
	(C) Atmospheric	(D) Low or high					
11.	Which of the following is not characteristics of concrete to be used as a good heat storage medium.			1	1	3	7
	(A) High specific het	(B) Good mechanical properties					
	(C) High thermal expansion co-efficient	(D) High mechanical resistance					
12.	What is a major drawback of shape stabilized PCM?			1	2	3	1
	(A) Lower thermal conductivity	(B) Possibility of super cooling					
	(C) Possibility of leakage	(D) Non – congruent melting					
13.	Which of the following PCM is carcinogenic?			1	1	3	1
	(A) Paraffin wax	(B) Fatty acids					
	(C) Salt hydrates	(D) Water					
14.	The melting point of the PCM must be _____ the ambient conditions.			1	1	3	1
	(A) Below	(B) Above					
	(C) Equal to	(D) One third					
15.	Compounds formed by mixing two or more PCMS.			1	2	3	1
	(A) Peritectics	(B) Eutectics					
	(C) Monotectis	(D) Syntectics					
16.	What is the advantage of air compared to other liquir heat transfer fluids?			1	2	4	1
	(A) Very low dynamic viscosity	(B) Very high boiling point					
	(C) Very high thermal conductivity	(D) Very high thermal conductivity					
17.	Thermal conductive of the composite PCM does not depend on			1	2	4	1
	(A) Shape	(B) Size					
	(C) Aspect ratio	(D) Agglomeration					
18.	Which is not a classification of inter-tube falling film modes?			1	2	4	1
	(A) The droplet mode	(B) The jet mode					
	(C) The sheet mode	(D) The bubble mode					
19.	Carbon based additives are preferred because of			1	2	4	5
	(A) Low thermal conductivity	(B) Instable chemical nature					
	(C) Extensive usability	(D) High density					
20.	PCM posses large _____.			1	1	4	1
	(A) Latent heat	(B) Sensible heat					
	(C) Chemical energy	(D) Internal energy					

21.	Which of the following is both a heating and lighting technique?			1	1	5	7
	(A) Ventilation	(B) Earth contact					
	(C) Thermal storage wall	(D) Sunspace					
22.	Super cooling occurs when			1	2	5	1
	(A) A liquid freeze although its temperature is above its freezing point	(B) A liquid does not freeze although its temperature is below its freezing point					
	(C) A liquid freeze at its freezing point	(D) A liquid does not freeze if its temperature is above its freezing point					
23.	The method used to enhance heat capacity of therminol VP-I?			1	2	5	1
	(A) Addition of nano particles	(B) Addition of stable salts					
	(C) Addition of metal pellets	(D) Addition of crude oil					
24.	Cold storage mainly used to			1	2	5	7
	(A) Increase electrical power consumption	(B) Decrease electric power consumption					
	(C) Increase heating loads	(D) Increase cooling loads					
25.	Building orientation is the _____ of a building on a site.			1	1	5	7
	(A) Positioning	(B) Design					
	(C) Heating	(D) Development					

PART – B (5 × 10 = 50 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
26. a.	How are energy storage systems classified? Explain different energy storage by chemical medium.	10	2	1	1
	(OR)				
b.	Explain in detail about bore-hole thermal storage system and cavern thermal storage system.	10	3	1	1
27. a.	Explain short term and long term sensible thermal storage (STES) system in detail.	10	2	2	1
	(OR)				
b.	Describe the working of solar pond thermal energy storage with neat sketch.	10	2	2	1
28. a.	Explain in detail about floor heating system using thermochemical energy storage.	10	2	3	1
	(OR)				
b.	Describe in detail about chilled water-PCM cool thermal energy storage.	10	3	3	1