

B.E Power Engineering 3rd Year 2nd Semester Examination – 2023
Subject: Energy Conservation & Sustainability, Time: 3 Hrs.

Full Marks: 100

Answer the questions as per given instructions		Marks
[1]	Answer any five from this question [CO1]	[5×2=10]
(a)	Define energy conservation.	
(b)	Briefly state objectives of Indian Green Building Council (IGBC).	
(c)	Briefly define the major areas of ISO 14000 EMS (Environmental Management System) certification.	
(d)	What do you mean by preliminary energy audit?	
(e)	What are the factors effecting waste heat recovery feasibility?	
(f)	Name different types of dust collecting equipments.	
(g)	Briefly state the benefits of soft starter over the normal starter for induction motor operation.	
(h)	What are the methods of disposal for high level radioactive waste?	
(i)	Define Latent Heat Thermal Storage.	
(j)	What are the three spheres of Sustainability?	
[2]	Answer any two from this question [CO2]	[10×2=20]
(a)	Why do we need thermal energy storage? Classify different methods of thermal energy storage.	[5+5]
(b)	Classify Waste Heat Recovery System (WHRS) on the basis of type of equipment. Briefly explain any one type waste heat recovery equipment with a neat sketch.	[4+6]
(c)	What is Pulverized fuel boiler? Briefly state the advantages & disadvantages.	[5+5]
[3]	Answer any two from this question [CO3]	[10×2=20]
(a)	State the steps of energy audit. What are the difference between normal & energy efficient motor?	[5+5]
(b)	Briefly explain energy efficient lighting control.	[10]
(c)	Briefly state the benefits of green building. Briefly explain the source of materials & type of equipments are used in Green Building.	[4+6]
[4]	Answer any two from this question [CO4]	[10×2=20]
a)	State the principle of operation of Flue Gas Desulphurization (FGD). State the benefits of this system.	[6+4]
b)	Briefly explain Selective Catalytic Reduction (SCR). Name different components of SCR.	[8+2]
(c)	Classify nuclear waste. Briefly explain the disposal process of any one type nuclear waste.	[2+8]
(d)	Briefly explain the objective of Perform Achieve & Trade scheme (PAT). What are the elements of PAT?	[6+4]
[5]	Answer all from this question [CO5]	[15×2=30]
(a)	A college has three departments (Physics, Chemistry & Mathematics) & their details of electrical appliances & respective loading durations are shown in Table 1&2 . Energy cost is Rs.8/unit. Working is on the basis of 5 days in week. Draw Sankey diagram along with calculate 3 rd year total costing for existing setup. Finally perform energy audit with calculation of saving in rupees per Annum with payback period calculation when replacing energy efficient devices. Also calculate Star rating of building (from EPI calculation). Use data from Table:1 (Loading topology department wise); Table:2 (Details of normal & energy efficient devices) & those are shown in next page.	[15]
(b)	Calculate the Green Building Index (GBI) of a specified building using the data provided in Table: 3 & from that value conclude on the grading of the building. Assume: Gross floor area=253595m ² , service life=60Years Use following Equations: 1. $GBI=(\text{Building Hospitality Index, } Q) \times (\text{Carbon Economic Index, } E) / (\text{Carbon Emission Index, } C)$ 2. $C=\alpha \times (EC_E/EC_R) + \beta \times (OC_E/OC_R)$, where α, β are Weights of area=0.125, EC_E & EC_R =Embodied carbon emission in evaluated building & reference building in construction phase, OC_E & OC_R =Operational carbon emission in evaluated & reference building in operational & maintenance phase. 3. $Q=\sum_{i=1}^5 \left(\frac{S_i \times W_i}{DM_i} \right) \times \frac{1}{100}$, where S_i = Score obtained in evaluated building in specific area i , DM_i & W_i are allotted scores & weights for accessing carbon emission from that specific area. 4. $CE=\frac{\Delta RB}{\Delta IC} \times 100 = \left(\frac{OER-OEE+CB}{ICE-ICR} \right) \times 100$, where ΔRB , ΔIC are carbon emission reduction benefit & increased construction cost, OER & OEE are annual operational cost for reference building & evaluated building, ICE & ICR are initial construction cost of evaluated building & reference building, CB is carbon emission trading profit, CE is carbon economic efficiency,	[15]

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		area (Kg/m ²)							
GBI≥4	Green 1st	EC _E =455.5	Ecology	31	32	22.5	Initial construction cost	ICE=358.2	ICR=268.4
3≤GBI<4	Green 2nd	EC _R =678.5	Health	30	45	33.0	Annual operational cost	OEE=6.6	OER=11.1
2.5≤GBI<3	Green 3 rd	OC _E =1180	Function	23	33	27.0	Annual carbon emission trading profit	CB=0.6	CB=0.0
2≤GBI<2.5	Green 4th	OC _R =2655.6	Energy Efficiency	36	36	26.0			
GBI<2	Out of Grade		Resource Efficiency	32	27	30.05			