UNIVERSITY WITH A PURPOSE

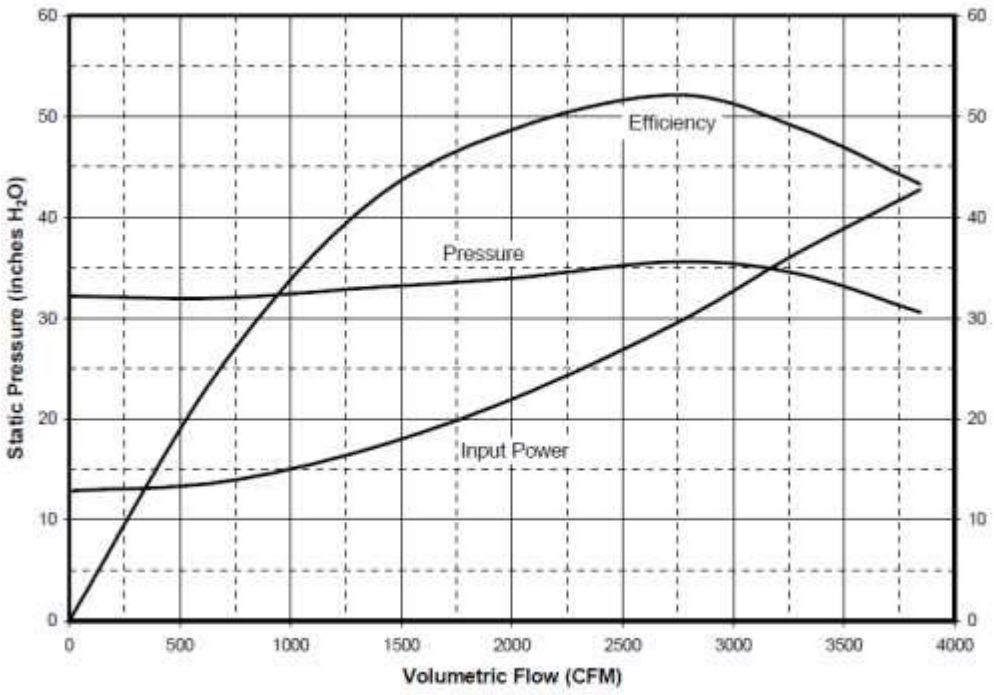
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Performance Analysis of Electrical Equipment **Semester : III**
Program: M.Tech. – Energy System **Duration: 03 hrs.**
Course Code: EPEC 8001 **Max. Marks: 100**

Instructions:

SECTION A
(Scan and upload) (5Qx 4M = 20 Marks)

S. No.		Marks	CO
Q 1	Write the full form of following abbreviations: a) IGBC b) GRIHA c) NABERS d) USEPA	**4**	**CO4**
Q 2	A commercial building located in warm and humid climatic region, has a built up area of 17814 m^2. The annual energy consumption of the building is 3735640 kWh from the Grid and 2964758 kWh from captive DG sets. The facility operates 12 hours a day and 250 days in a year. Calculate: a) EPI b) AAHEPI	**4**	**CO4**
Q 3	For each one of the following, mention whether they belong to "Prescriptive Method" or "Whole Building Performance Method". a) Compliance by meeting or exceeding specific levels for each individual element of building b) Allows Trade-off option for building envelope c) Allows use of energy simulation software d) Computer model of the proposed design (energy consumption) is compared with Standard Design e) Compliance if energy use in proposed design is less than energy use in standard design	**4**	**CO4**

Q 4	Given below is a set of curves for a centrifugal fan.  At its Best Efficiency Point (BEP) and to the nearest approximation give the following values: a) Static pressure in mmWC = _____ b) Flow in m^3/hr = _____ c) Shaft Power in kW = _____ d) Work out the static efficiency of the fan by calculation = _____ e) Power drawn by the motor if the motor operating efficiency is 90 % = _____	**4**	**CO1**
Q 5	List flow control methods adopted in a fan system.	**4**	**CO1**
	SECTION B **(Scan and upload)** **(4Qx 10M = 40 Marks)**		
Q 1	A 75 kW, 415 V, 140 Amp, 4 pole, 50 Hz, 3-phase squirrel cage induction motor has a full load efficiency of 87.6%. The measured operating motor terminal voltages in a 3-phase supply are 415 V, 418 V & 420 V. The current drawn in 3-phase supply are 137 Amp, 132 Amp & 137 Amp. Estimate the additional temperature rise of motor, due to unbalanced voltage supply.	**10**	**CO3**

Q 2	Discuss the merits of VSD application in case of pumps.	**10**	**CO3**
Q 3	With the help of block diagram, describe Building Management System.	**10**	**CO4**
Q 4	Write short notes on any two of the following: a) Solar Heat Gain Coefficient (SHGC) b) Visible Light Transmittance (VLT) c) Cool Roof	**10**	**CO4**
Section C **(Scan and upload)** **(2Qx 20M = 40 Marks)**			
Q 1	In an automobile industry one compressor of rated capacity of 1000cfm is operated to evaluate leakage quantity in the plant during a holiday when no equipment was using compressed air. FAD test was also carried out before conducting leakage test and found that the compressor is delivering output of 90% of rated capacity. The observation on leakage test are: a) Compressor was on full load for 8 min b) Compressor was unloaded for 48 min c) Compressor was consuming 144 kW Evaluate : a) Free air delivery b) specific power consumption c) % leakage in compressed air system d) Leakage quantity e) power lost due to leakage **OR** A free air delivery test was carried out before conducting a leakage test on a reciprocating air compressor in an engineering industry and following were the observations: Receiver capacity : 10 m^3 Initial pressure : 0.2 kg / cm^2g Final pressure : 7.0 kg / cm^2g Additional hold-up volume : 0.2 m^3 Atmospheric pressure : 1.026 kg / cm^2 abs. Compressor pump-up time : 4.5 minutes	**20**	**CO1**

	The following was observed during the conduct of leakage test during the lunch time when no pneumatic equipment/ control valves were in operation: a) Compressor on load time is 30 seconds and unloading pressure is 7 kg/cm^{2}g b) Average power drawn by the compressor during loading is 90 kW c) compressor unload time and loading pressure are 70 seconds and 6.6 kg/cm^2 g respectively. Find out the following: (i) Compressor output in m^3/hr (neglect temperature correction) (ii) Specific Power Consumption, kW/ m^3/hr (iii) % air leakage in the system (iv) leakage quantity in m^3/hr (v) power lost due to leakage		
Q 2	a) A pump is filling water in to a rectangular overhead tank of 5 m x 4 m with a height of 8 m. The inlet pipe to the tank is located at height of 22 m above ground. The following additional data is collected : Pump suction : 3 m below pump level Overhead tank overflow line : 7.5 m from the bottom of the tank Power drawn by motor : 5.5 kW Motor efficiency η : 90 % Time taken by the pump to fill the overhead tank upto overflow level : 180 minutes Assess the pump efficiency. b) Explain in detail the head flow characteristics of parallel operation of pumps with necessary pump curves.	**10 + 10**	**CO2**