**TU/ CODL**

**TEZPUR UNIVERSITY**

**SEMESTER END EXAMINATION (SPRING) 2020**

**DRE 203: ENERGY EFFICIENCY IN ELECTRICAL UTILITIES**

Time: **3 Hours** Total Marks: **70**

*The figures in the right-hand margin indicate marks for the individual question.*

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1. Select appropriate answer from the following: 10×1=10

a) If inlet and outlet water temperatures of a cooling tower are 40°C

and 33°C, respectively and atmospheric WBT is 30 °C then the

efficiency of the cooling tower is:

i. 70% ii. 72% iii. 75% iv. 77%

b) The maximum unbalanced load between phases should not exceed

…… % of the capacity of the DG set:

i. 2 ii. 10 iii. 8 iv. 10

c) The nearest kVA rating required for a DG set with 1000 kW

connected load, with diversity factor of 1.5 and 80% loading and

0.84 power factor is:

i. 1000 ii. 500 iii. 1500 iv. 2000

d) The required air conditioner size for comfort conditions for general

living room (12' × 12') at residence is:

i. < 0.5 TR ii. 1.25 – 1.5 TR iii. 2 – 2.5 TR iv. >2.5TR

e) A modern electronic starter is used in motor to:

i. achieve variable speed ii. provide smooth start and stop

iii. improve the loading iv. none of the above

f) Luminous efficacy of which of the following lamps is the highest?

i. HPMV ii. HPSV iii. LPSV iv. CFL

g) A device that distributes and filters the light emitted from one or

more lamps is:

i. Control gear ii. Lamp iii. Luminaire iv. Starter

**P.T.O.**

h) The volumetric efficiency of the compressor \_\_\_\_\_\_ with the increase in

altitude of place:

i. increases ii. decreases

iii. remains constant iv. may increase/decrease

I) The compression ratio in diesel engines is in the range of

i. 14:1 to 25:1 ii. 10:1 to 13:1

iii. 5:1 to 10:1 iv. 10:1 to 15:1

j) The input power to an 18 kW, 415 V, 4 pole, 50 Hz, 3 phase squirrel cage

induction motor with a full load efficiency of 92% and power factor of

0.90 is:

i. 18 kW ii. 16.5 kW

iii. 16.2 kW iv. 20 kW

2. How does the power factor of an induction motor improve with the

increase in the applied load on the motor? 5

3. How does a Vapour Adsorption System work? What is the main

difference between Vapour Compression and Vapour Absorption

Refrigeration systems? 5+5=10

4. List the energy conservation opportunities in a cooling tower system.

10

5. List down five important parameters that influence the selection of an

induction motor. 5

6. Explain different components of tariff structure in the electricity billing

of medium and large enterprises. 5

7. Calculate the annual energy savings and simple payback from replacing

an existing standard motor with a premium efficiency motor versus

repairing a standard efficiency motor with a sample example. 5

8. A 3 phase, 415 V, 100 kW induction motor is drawing 50 kW at a 0.75

PF. Calculate the capacitor rating requirements at motor terminals for

improving PF to 0.95. Also, calculate the reduction in current drawn

and kVA reduction, from the point of installation back to the generating

side due to the improved PF. What is the percentage reduction in

distribution losses per month if PF is improved up to 0.95 at load end? 4+4+2=10

9. Explain the possibility of implementing waste heat recovery for the

following DG Set: 7

**Outputs:**

Electrical output: 38%

Stack loss through flue gas: 30%

Coolant losses: 20%

Alternator losses: 4%

Radiation losses: 8%

10. What is the significance of back pressure in the flue gas path while

recovering waste heat in a DG set? 3

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