**TU/ CDOE**

**TEZPUR UNIVERSITY**

**SEMESTER END EXAMINATION (AUTUMN) 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 the correct option: 1x10=10

1. The rating required for a DG set with 500 kW connected load and with diversity factor of 1.5, 80% loading and 0.8 power factor is \_\_\_\_\_

i) 520 kVA ii) 600 kVA iii) 625 kVA iv) 500 kVA

1. Auxiliary power consumption of DG set at full load in its operating capacity is about \_\_\_\_\_.

i) 1 - 2% ii) 5 – 6% iii) 10 - 12% iv) Above 15%

1. Replacing a 500 W HPMV with 200 V HPSV lamp in street lighting operate for 4000 hours per annum will result in annual energy savings of:

i) 800 kWh ii) 600 kWh iii) 1000 kWh iv) 1200 kWh

1. If voltage applied to a 415 V rated capacitors drops by 20%, its VAR output drops by \_\_\_\_.

i) 23% ii) 36% iii) 19% iv) 20%

1. With increase in speed of the motor, the required capacitive kVAr:

i) Increases ii) Decreases

iii)Does not change iv) None of the above

1. The percentage reduction in distribution loses when tail end power factor raised from 0.75 to 0.95 is \_\_\_\_\_\_\_\_.

i) 84% ii) 79% iii) 21% iv) 20%

1. The maximum demand of an industry, if trivector meter records 3000 KVA for 10 minutes and 3600 kVA for next 20 minutes over a recording cycle of 30 minutes is\_\_\_\_\_.

i) 3300 kVA ii) 2600 kVA iii) 3400 kVA iv) 3600 kVA

**P.T.O.**

1. The motor efficiency is 0.9 and pump efficiency is 0.5. The power transmitted to the water is 13.5 kW. The input power to the motor driving the pump is about:

i) 30 kW ii) 15 kW iii) 27 kW iv) 24.3 kW

1. If the speed of a pump is doubled, pump shaft power goes up by:

i) 4 times ii) 8 times iii) 6 times iv) 2 times

1. Five percent increase in supply frequency will change the synchronous speed by:

i) -5% ii) +10% iii) -10% iv) +5%

2. The recommended air-fuel ratio of a DG set is 14:1 and the generator

is rated at 1000 kVA, 415V, 1390 A, 0.8 PF, 1500 RPM. The specific

energy consumption of the DG set was measured at full load as 4

kWh/litre of diesel. An energy auditor recommended to go for waste

heat recovery system and claimed that around 2.6×105 kCal/h waste

heat can be recovered at the existing engine exhaust at 583 °C.

Calculate the exhaust gas temperature after installation of the

proposed WHR system. The density of the diesel oil used was 0.83

kg/litre with a specific heat of flue gas is 0.25 kCal/kg-°C. 10

3. Explain the reasons behind high T&D losses in electrical system. What are

the short term and long term measures that should be adopted to reduce

the technical T&D loss in India? 10

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

of medium and large enterprises. How does it differ from that of a

domestic electricity bill? 10

5. 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. 5

6. A process plant consumes of 1,25,000 kWh per month at 0.9 Power Factor

(PF). What is the percentage reduction in distribution losses per month

if PF is improved up to 0.96 at load end?

10+5=15

7. What are the steps that need to be followed in a lighting system audit of

an industrial entity? 10

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