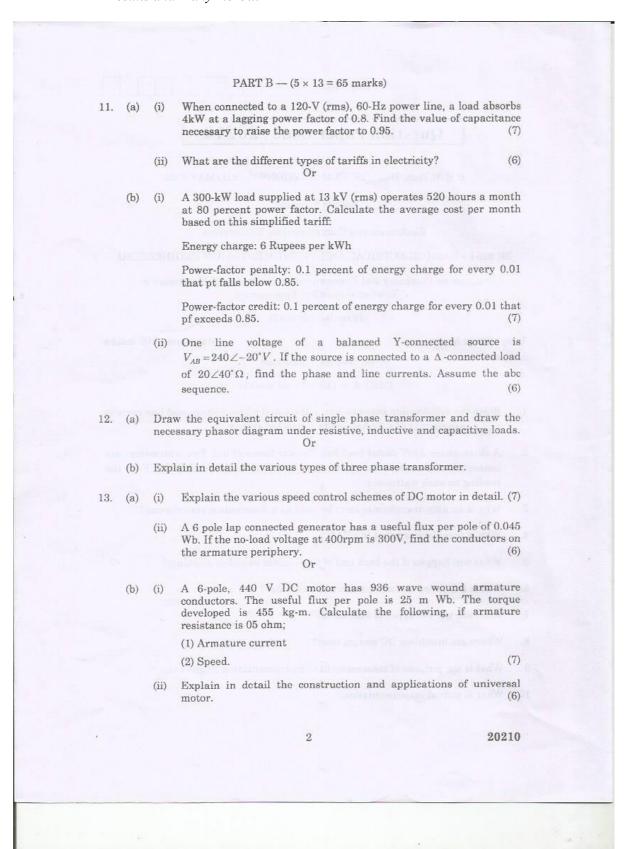Reg. No. :

Question Paper Code : 20210

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Second Semester

Electronics and Communication Engineering

BE 8254 – BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING

(Common to: Computer and Communication Engineering/ Electronics and Telecommunication Engineering)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the relationship between line voltage and phase voltage and line current and phase current of a 3-phase delta connected system

2. A three phase 440V motor load has a power factor of 0.6. Two wattmeters are connected to measure the input power and it is found to be 25kW. Find the reading on each wattmeter.

3. Why is an auto-transformer can't be used as a distribution transformer?

4. Why is transformer rated in kVA?

5. What will happen if the back emf of a DC motor vanishes suddenly?

6. Which DC series motor is preferred for elevator?

7. What are the two types of alternators?

8. Where are brushless DC motors used?

9. What is the purpose of measurement in instrumentation Engineering?

10. What is virtual instrumentation?

PART B — (5 × 13 = 65 marks)

11. (a) (i) When connected to a 120-V (rms), 60-Hz power line, a load absorbs 4kW at a lagging power factor of 0.8. Find the value of capacitance necessary to raise the power factor to 0.95. (7)

    (ii) What are the different types of tariffs in electricity? (6)

Or

    (b) (i) A 300-kW load supplied at 13 kV (rms) operates 520 hours a month at 80 percent power factor. Calculate the average cost per month based on this simplified tariff:

Energy charge: 6 Rupees per kWh

Power-factor penalty: 0.1 percent of energy charge for every 0.01 that pt falls below 0.85.

Power-factor credit: 0.1 percent of energy charge for every 0.01 that pf exceeds 0.85. (7)

    (ii) One line voltage of a balanced Y-connected source is $V_{AB} = 240\angle -20°V$. If the source is connected to a Δ-connected load of $20\angle 40°\Omega$, find the phase and line currents. Assume the abc sequence. (6)

12. (a) Draw the equivalent circuit of single phase transformer and draw the necessary phasor diagram under resistive, inductive and capacitive loads.

Or

    (b) Explain in detail the various types of three phase transformer.

13. (a) (i) Explain the various speed control schemes of DC motor in detail. (7)

    (ii) A 6 pole lap connected generator has a useful flux per pole of 0.045 Wb. If the no-load voltage at 400rpm is 300V, find the conductors on the armature periphery. (6)

Or

    (b) (i) A 6-pole, 440 V DC motor has 936 wave wound armature conductors. The useful flux per pole is 25 m Wb. The torque developed is 455 kg-m. Calculate the following, if armature resistance is 05 ohm;

        (1) Armature current

        (2) Speed. (7)

    (ii) Explain in detail the construction and applications of universal motor. (6)

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14. (a) Name the motor used in ceiling fans and explain its construction, principle of operation with a neat diagram.

Or

(b) Identify the motor used in CNC machines and 3D printers and explain its construction, principle of operation with a neat diagram.

15. (a) List out the dynamic characteristics of any measurement system

Or

(b) Discuss the errors involved in a measurement system

PART C — (1 × 15 = 15 marks)

16. (a) A machine has a 480-V, 3-phase electrical motor as an integral part of the machine. The total machine load requirement is 10 A at 480 V. If the building has a 240-V, 3-phase electrical system, determine the minimum-kVA 3-phase transformer required.

Or

(b) Why a three phase induction motor is called as rotating transformer? Explain the (V/f) speed control scheme of three phase induction motor, considering electric vehicle as an example.

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