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**Question Paper Code: R2404**

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2025

First Semester

Electronics and Communication Engineering

R21UEC204- BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5Marks)

1. The impedance of a series circuit consists of 3 ohm resistance and 4 ohm reactance. The power factor of the circuit is: CO1-U  
(a) 0.4                      (b) 0.6                      (c) 0.8                      (d) 1
2. The field winding of a three phase synchronous machine is excited by CO1-U  
(a) Single phase ac supply                      (b) Three-phase ac supply  
(c) DC supply                      (d) Supply obtained from an inverter
3. A 10 mA PMMC ammeter reads 4 mA in a circuit. Its bottom control spring snaps suddenly. The meter will now show \_\_\_\_\_ CO1-U  
(a) 10 mA                      (b) 8 mA                      (c) 2 mA                      (d) Zero
4. Which of the following signals are generated by Wien-bridge oscillators? CO1-U  
(a) Square wave                      (b) Sine wave                      (c) Triangular wave                      (d) Pulse wave
5. CRO gives the visual representation of time varying signals. The Display of the signal is CO1-U  
(a) One dimensional                      (b) Two dimensional  
(c) Three dimensional                      (d) Four dimensional

PART – B (5 x 3= 15 Marks)

6. A resistance of  $7\Omega$  is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 100 V 50 Hz sinusoidal supply. Utilize phase angle to determine power factor. CO3-App
7. Write some advantages and disadvantages of Single Phase Induction Motor CO1-U
8. What value of shunt resistance is required for using a 50- $\mu$ A meter movement, with an internal resistance of 250  $\Omega$ , for measuring 0-500mA? CO5-App
9. Draw the schematic diagram of simple sine wave generator and explain it briefly. CO2-U
10. How is the electron beam focused to a fine spot on the face of the cathode ray tube? CO2-U

PART – C (5 x 16= 80 Marks)

11. (a) A 50Hz, alternating voltage of 150V(r.m.s) is applied independently to (i) Resistance of 10  $\Omega$  (ii) Inductance of 0.2H (iii) Capacitance of 50  $\mu$ F. Using appropriate AC circuit laws, calculate the instantaneous current expression for each case. Also, apply phasor concepts to construct the corresponding current–voltage phasor diagrams for the resistor, inductor, and capacitor. CO3-App (16)  
Or  
(b) (i) A resistance of 5  $\Omega$ , an inductance of 10 mH and a capacitor of 200 $\mu$ F are connected in series and the combination is connected across a 230V, 50Hz supply. Calculate the current flowing through the circuit and the power factor using appropriate AC circuit relationship. CO3-App (16)  
  
(ii) A coil of power factor 0.6 is in series with a 100  $\mu$ F capacitor. When connected to 50 Hz supply, the potential difference across the coil is equal to potential difference across the capacitor. Find the resistance and Inductance of the circuit.
12. (a) Explain in detail the principle of operation of 1 $\phi$  induction motor. CO1-U (16)  
Or  
(b) Explain different stepping modes of stepper motor, compare the stepping modes and apply the concepts to choose the right step mode for the stepper motor for various applications. CO1-U (16)

13. (a) Design a multi-range DC Ammeter having a resistance  $75\Omega$  and full scale deflection for the current of 2mA. The required ranges are 0- 10mA, 0-50mA and 0-100mA. CO5-App (16)
- Or
- (b) Apply the principle of operation of shunt type ohmmeter to derive the expression for the external resistance causing half scale deflection with its schematic. CO5-App (16)
14. (a) Explain how LC tuned oscillators generate sine waves in sine wave generator with necessary circuit diagram. CO2-U (16)
- Or
- (b) Explain how free running multivibrator generates pulse and square waves with necessary circuit diagram and waveforms. CO2-U (16)
15. (a) Illustrate the purpose of vertical and horizontal deflection systems in CRO with necessary circuits. CO2-U (16)
- Or
- (b) Explain how does a digital storage oscilloscope differ from an analog storage oscilloscope in terms of signal storage? What are the advantages of each? CO1-U (16)

