UNIVERSITY OF NORTH BENGAL

SEC 1st Semester Examination, 2024

SEC - UPHYSEC11001-PHYSICS

BASIC ELECTRICAL CIRCUITS AND MEASUREMENTS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A
(Compulsory)

1. Choose the correct alternative: $1\times5 = 5$

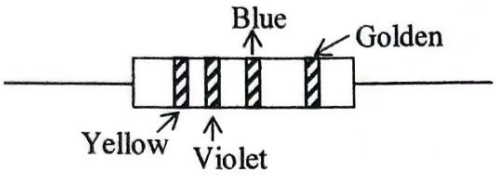
(a) If the household power supply be 200 V a.c., then voltage amplitude V_0 is

(A) 200 V (B) 100 V (C) 283 V (D) None of these

(b) If the inductance L, capacitance C and a resistance R are connected in series then in resonance the impedance of the circuit is

(A) R (B) zero (C) R/LC (D) infinity

(c) What is the resistance of carbon resistor looks as follows?



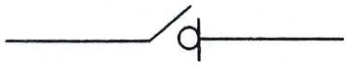
(A) $10 \pm 5\%$ MΩ (B) $10 \pm 10\%$ MΩ (C) $47 \pm 5\%$ MΩ (D) $47 \pm 10\%$ MΩ

(d) What is the polar representation of the voltage $(3+5j)$ V?

(A) $(\sqrt{34}, 1.03)$ radians (B) (8, 59.04) degrees

(C) $(\sqrt{34}, 8)$ radians (D) $(\sqrt{34}, 8)$ degrees

(e) The following figure represents a



(A) Relay (B) Non-fused disconnect switch

(C) Fused disconnect switch (D) Circuit breaker

GROUP-B

Answer any *three* questions from the following $5\times3 = 15$

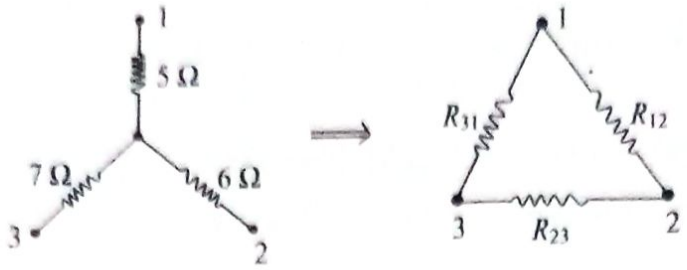
2. (a) What is complex power? 2

(b) In a circuit complex power is given as $S = 50+25j$ VA. Calculate (i) apparent power, (ii) power factor. 3

3. (a) Write down the advantages of AC generators over DC generators. 3

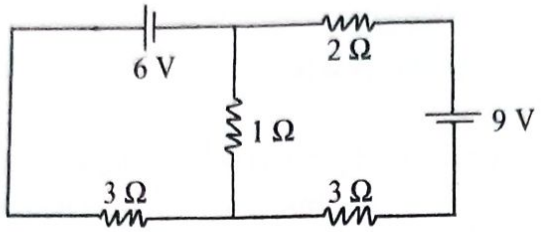
(b) In a transformer the number of primary and secondary windings is 60 and 100 respectively. If the secondary voltage be 250 V, determine the primary voltage. 2

4. In the following figure a star type construction of resistance is converted to delta-type configuration. Determine the resistances (R_{12}, R_{23}, R_{31}) between the terminals of delta-type system. 5



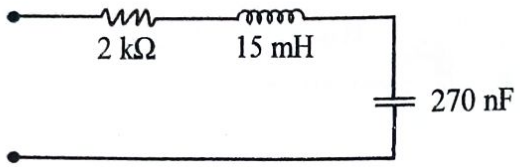
5. (a) State Kirchhoff's laws of electricity. 2

(b) Calculate the current that flows in the 1Ω resistor in the following circuit. 3



6. Draw a full wave rectifier using two diodes and explain its operation. 2+3

7. Determine the effective impedance of the following figure if the source frequency is 2 kHz. 5



GROUP-C

Answer any *two* questions from the following 10×2 = 20

8. (a) What are the advantages of three phase voltage system for supplying power? 2

(b) Deduce the relation between (i) Phase and line voltage, (ii) Phase and line current for a balanced three phase *Y* connected load (star connected). 5

(c) The input power of a 3-phase AC motor is measured as 5 kW. If the voltage and current to the motor are 400 W and 8.6 A respectively, determine the power factor of the system. 3

9. (a) What is a circuit breaker? With the help of a diagram discuss its working principle. 2+4

(b) What is SF_6 circuit breaker? Write down its advantages and disadvantages. 1+3

10. (a) What are the differences between Earthing and Grounding? 3

(b) Draw the diagrams of different types of grounding. 2

(c) What is surge protection? Discuss the working of surge protector. 1+4

11. (a) Derive the expression for the frequency of the generated emf in an AC generator. 4

(b) Mention different types of DC generators. Discuss different losses in a DC machine. 2+3

(c) Based on voltage levels write down the names of different transformers. 1

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