Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 40187

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Second Semester

Aeronautical Engineering

BE 8253 – BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING

(Common to : Aerospace Engineering/Automobile Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Material Science and Engineering/Mechanical Engineering/Mechanical Engineering (Sandwich)/Mechanical and Automation Engineering/Mechatronics Engineering/Production Engineering/Robotics and Automation)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   How much energy does a 100 W electric bulb consumes in 2 hours?

2.   State Ohm's law and its imitations.

3.   Give a sinusoidal voltage 30sin ($4\pi t$ − 75°) V, calculate its RMS value, phase, angular frequency, period and frequency.

4.   What is meant by power factor of an ac circuit? What is its minimum and maximum value?

5.   How a single phase induction motor is made self-starting?

6.   Why is the efficiency of a transformer higher than any other rotating electrical machine of similar ratings?

7.   What is Zener diode' How is it different from a p-n junction diode?

8.   What is an op-amp? Draw the pin diagram of IC op-amp 741?

9.   Distinguish between a passive and active transducer giving one example in each ease.

10. What are current and potential transformers (CT and PT)?

PART B — (5 × 13 = 65 marks)

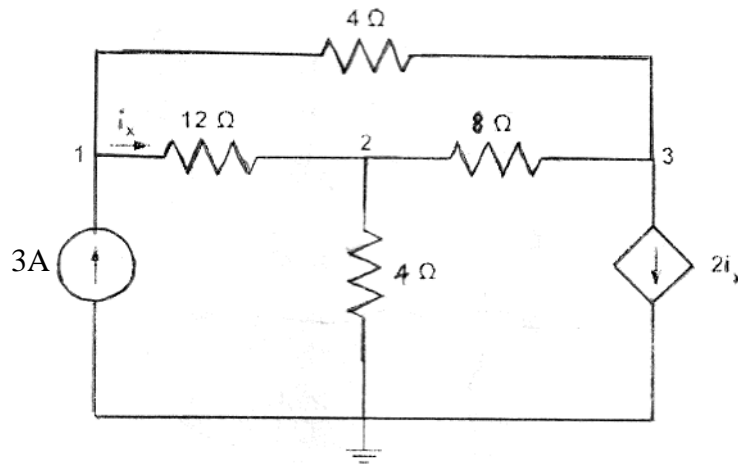11. (a) Determine the voltages at the nodes 1, 2 and 3 in Figure 1.

Figure. 1

Or

(b) Consider the circuit shown in Figure 2. Determine the thevenin's equivalent at the load terminals. Compute the power delivered to the load resistor R_L.
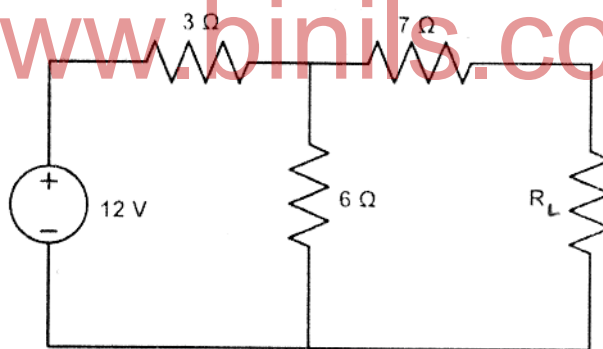

Figure. 2

12. (a) A resistance of 150 is connected in series with an inductance of 0.25H. The series combination is connected across 220V, 50 Hz A.C supply. Find impedance, circuit current, power factor phase angle and apparent power.

Or

(b) A balanced star connected load of $(3-j4)\,\Omega$ impedance is connected to 400 V three phase supply. What is the real power Consumed?

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13. (a) Draw a neat sketch of a dc machine and name the component parts. Explain the operation of the machine (i) as generator and (ii) as motor.

Or

(b) With neat diagram, describe the principle of working of 3 phase induction motor. Also explain why it cannot run at synchronous speed.

14. (a) With a neat sketch, explain the typical voltage-current (V-I) characteristics of a forward biased and reverse biased p-n junction diode.

Or

(b) Draw and explain (i) the drain and (ii) the transfer characteristics of a JFET. How is a FET different from a BJT.

15. (a) Explain the construction and working principle of an instrument that measures only dc. Derive an expression for torque developed in the instrument.

Or

(b) Explain with a neat sketch, the constructional details and operation of an inductive transducer that operates on mutual induction principle.

PART C — (1 × 15 = 15 marks)

16. (a) Eight bulbs are connected in series. If the series arrangement is connected to a 120 V DC source, (i) What is the current through the bulbs if each bulb has an internal resistance of $28.125\,\Omega$? (ii) Determine the power delivered to each bulb. (iii) Calculate the voltage drop across each bulb. (iv) If one bulb burns out (i.e. the filament opens), what is the effect on the remaining bulbs.

Or

(b) Prove that the power in balanced 3-phase circuit can be measured from the readings of two wattmeters. Draw the relevant connection and phasor diagrams. If the readings on two wattmeters so connected are 5 kW and 0.5 kW, calculate the power and power factor of the load.

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