Total No. of printed pages = 7

EE 181107

Roll No. of candidate

2018

B.Tech. 1st Semester End-Term Examination

BASIC ELECTRICAL ENGINEERING

(New Regulations)

(w.e.f. 2017-2018)

(New Syllabus)

(w.e.f. 2018-2019)

Full Marks – 70   Time – Three hours

GROUP – A

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1.   Choose the correct answer from each of the following
     questions: $(10 \times 1 = 10)$

   (i)   A $10\,\Omega$ resistor is connected in shunt to a
         parallel combination of two voltage sources
         each one of $100V$. What would be the current
         drawn by resistor?

         (a)   20A   (b)   10A
         (c)   5A   (d)   0A

   (ii) The internal resistance of a current and voltage
         source are
         (a)   infinity and zero respectively
         (b)   zero and infinity respectively
         (c)   Both zero
         (d)   Both infinity

[Turn over

(iii) In a linear circuit, the Thevenin's equivalent voltage and current are 5V and $15\,\Omega$ respectively. The Norton's equivalent current and resistance are

(a) 3A, 15Ω

(b) 5A, 15Ω

(c) $\dfrac{1}{3}$A, 15Ω

(d) $\dfrac{1}{3}$A, 75Ω

(iv) From factor for a sinusoidal waveform is

(a) 1.21

(b) 0.5

(c) 1.11

(d) $\dfrac{1}{\sqrt{2}}$

(v) The active and apparent power of an ac circuit are equal in magnitude. The circuit power factor is

(a) 0.707

(b) 0.5

(c) 0.8

(d) 1.0

(vi) In an R_L series AC circuit $R = X_L$. The phase angle is

(a) 90°

(b) 30°

(c) 45°

(d) Cannot be predicted

(vii) Moving iron and PMMC type instruments can be distinguished from each other by looking at the

(a) Pointer

(b) Terminal

(c) Scale

(d) All of the above

(viii) Which of the following essential features is possessed by an indicating instrument:

    (a) Deflecting device

    (b) Controlling device

    (c) Damping device

    (d) All of the above

(ix) The core of a transformer is laminated to

    (a) Make it safe to handle

    (b) Reduce reluctance of the magnetic circuit

    (c) Reduce core losses

    (d) Make the transformer mechanically strong

(x) In a DC generator, the function of the field winding is to

    (a) Impart mechanical motion to their generator

    (b) Produce magnetic flux

    (c) Convert AC into DC

    (d) Reduce over voltage of the generator

2. (a) In the circuit shown in Fig.1, find the node voltages at node 1 and 2 using nodal equation.
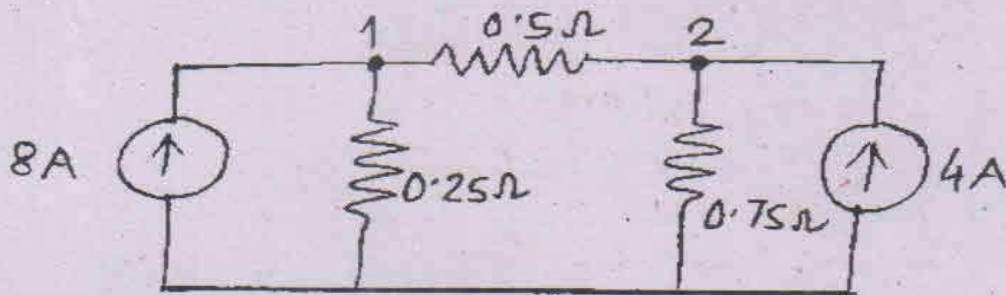
    (4)

Fig.1

(b) Apply superposition theorem in the circuit given in Fig.2 and calculate current through 3Ω resistance. (4)
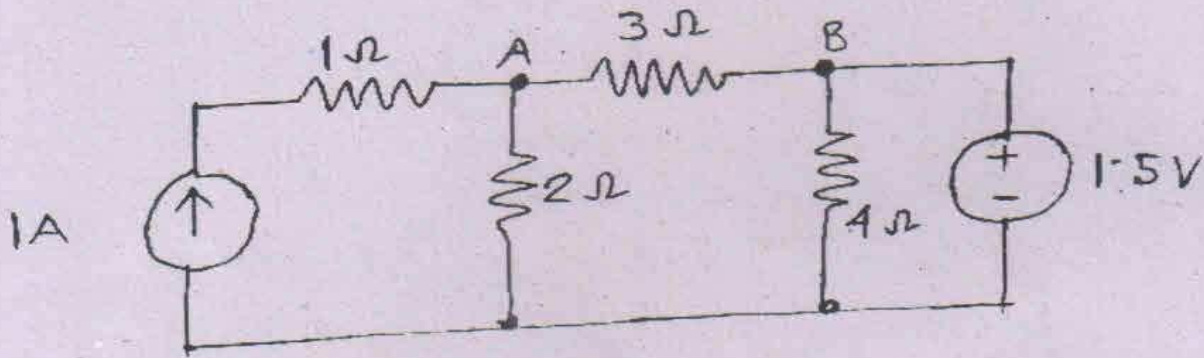

Fig.2

(c) Find the resistance R to be connected across the terminal AB of the circuit shown in Fig.3 to receive maximum power. Also calculate maximum power delivered to the resistance. (3)
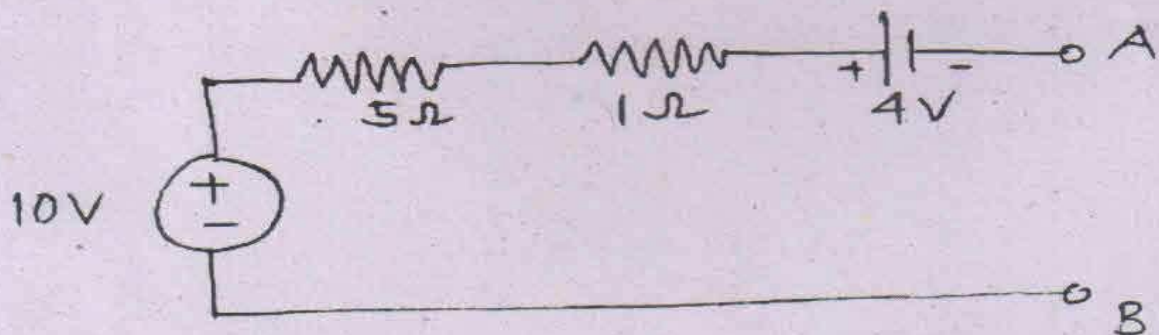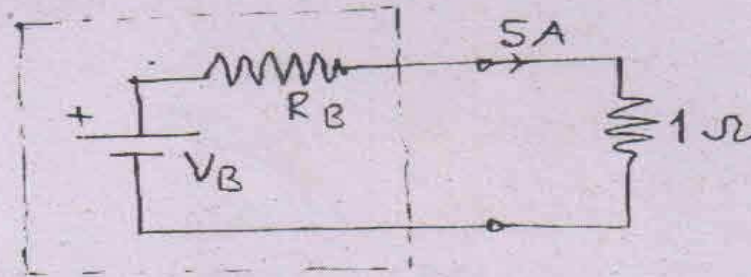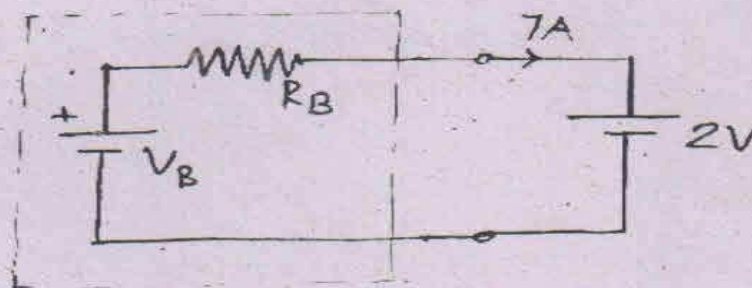

Fig.3

(d) A battery charger drives a current of 5A, when it is connected to a load resistor of 1Ω. The same battery charger is used for charging an ideal 2V voltage source at 7A rate. Find V_B and R_B as shown in Fig.4. (4)

Battery charger

Battery charger

Fig. 4

3. (a) Answer the following questions:

(i) Convert the following complex quantity into a polar form.
$$\overline{Z} = (6 - j12) + (10 + j15).$$ (2)

(ii) An iron cored coil connected to a 100V, 50 HZ supply is found to take a current of 5A and to dissipate a power of 200 W. Calculate the resistance, inductance and power factor. (5)

(b) Two impedances Z_1 and Z_2 are connected in parallel. The first branch takes a leading current of 16A and has a resistance of 5 ohms, while the second branch takes a lagging current at a power factor of 0.8 of the applied voltage being $(100 + j200)V$ and total power supplied is 5 KW, determine the complex expression for branch current, total current and the circuit constants. (8)

4. (a) A circuit consists of parallel impedances $(3 + j4)\Omega$ and $(5 - j3)\Omega$ and is connected in series with an impedance of $(1 + j2)\Omega$. If a 200 V AC supply is connected across the combination, calculate the supply current, over all power factor and voltage drop across each impedance. (8)

(b) Derive the relationship between line and phase voltages of a three phase star connected system. Three similar inductors, each of resistance 20Ω and inductance of 0.05 H are connected in the form of delta to a three phase 415 V, 50 HZ supply. Calculate the line currents.

(4 + 3)

5. (a) Give the classification of DC generator with the help of neat circuit diagram. (8)

(b) Explain, how speed of a DC motor can be controlled? (7)

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6. (a) The supply voltage to a lap connected DC shunt motor is 200 V, the shunt field resistance is 200 ohm and the armature resistance is 1 ohm. The number of conductor being 1520 and flux per pole is 3 mWb. If the input current to the motor is 10 A, determine the speed of the motor. (8)

(b) Describe with neat sketches the construction and working principle of PMMC type instrument. (7)

7. (a) Explain different essential torques in indicating instruments.

A moving coil instrument gives a full scale reading of 25 mA, the voltage across its terminals is 75 mV. Show how it can be used to measure (3 + 4)

(i) A current of 100 A and

(ii) A voltage of 750 V.

(b) Answer the following questions:

(i) Name the various types of wiring systems.

(ii) What is the necessity of fuse in an electric circuit? Why is a fuse inserted in the phase wire, never in neutral wire?

(iii) What are the functions of earthing in an electrical installation? (1 + 2 + 2 = 5)

(c) Draw wiring diagram of a circuit consists of a lamp, a fan and a socket outlet which are controlled by individual switches. (3)

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