

**B.Tech. SEM -I (Civil/ Electrical/ Mechanical/ Production/ Computer/
Info. Tech. 2014 Course (CBCS) : WINTER - 2018**

SUBJECT: FUNDAMENTALS OF ELECTRICAL ENGINEERING

Day : Saturday
Date: 01/12/2018

Time : 10.00 AM TO 01.00 PM
Max. Marks : 60

W-2018-2266

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labeled diagram **WHEREVER** necessary.
- 4) Assume suitable data, if necessary.

Q. 1 a) Prove that: (05)

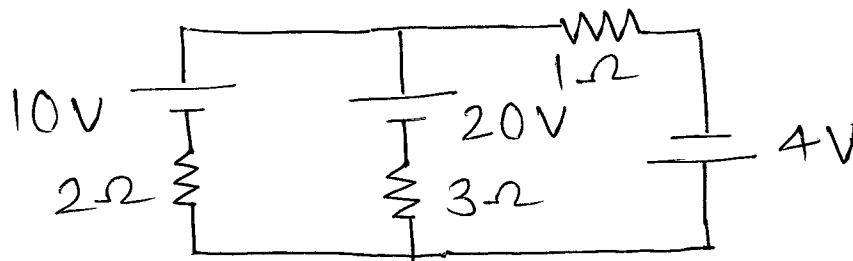
$$\alpha_t = \frac{\alpha_0}{1 + \alpha_0 t}$$

- b) A belt driven pulley 0.4 m in diameter rotates at a speed of 4 rps. The tension in the tight side of belt is 450 N and that on slack side is 100 N. Calculate: (05)**
- i) Torque on the pulley
 - ii) The power developed

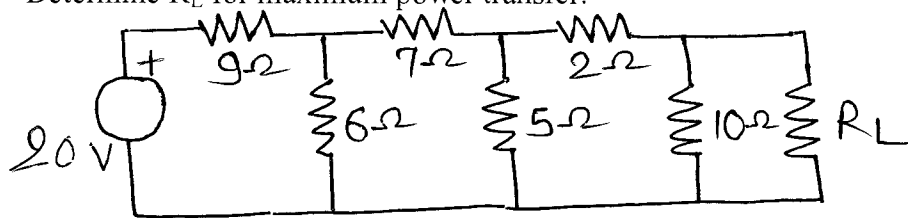
OR

- a) Define temperature coefficient of resistance. Also derive an expression of it. (05)**
- b) A specimen of copper wire has a temperature coefficient of $\frac{1}{254.5}$ per $^{\circ}\text{C}$ at 20°C . Find the temperature coefficient at 0°C . (05)**

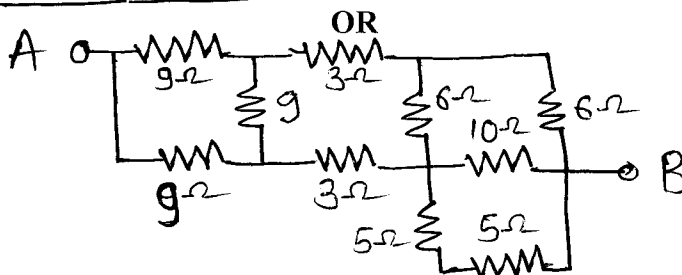
Q. 2 a) Calculate current in $3\ \Omega$ resistor using Thevenin's theorem: (05)



b) Determine R_L for maximum power transfer: (05)

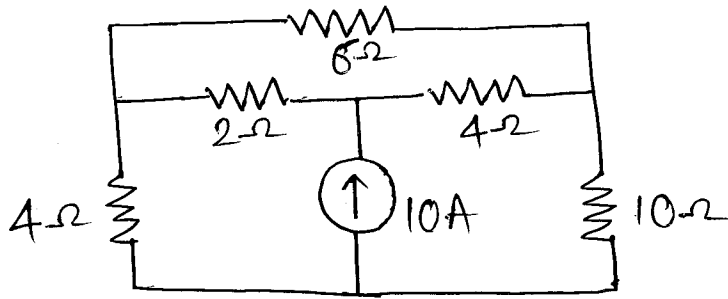


a) Find R_{AB} (05)



P. T. O.

- b) Find the voltage drop in $10\ \Omega$ resistor using Nodal analysis: (05)



- Q. 3 a) Define the following. Give their expression and units: (05)

- i) Electric flux density
- ii) Permittivity

- b) Calculate the capacitance of a parallel plate capacitor consisting of two metal plates each $60\text{ cm} \times 60\text{ cm}$ separated by a dielectric 1.5 mm thick and of relative permittivity 3.5 . If a potential of 500 V is applied find charge, electric flux density (05)

OR

- a) Derive the expression for the energy stored in capacitor. (05)
- b) A parallel plate capacitor has two metal plates of area 2.5 m^2 separated by three slabs of different dielectric materials. The relative permittivity of these dielectric materials are $1, 3, 5$ and the thickness is $0.5, 1, 2\text{ mm}$. respectively. Calculate: Capacitance of the capacitor. (05)

- Q. 4 a) Explain in brief (05)

- i) Statically induced EMF
- ii) Dynamically induced EMF

- b) A $3300/110\text{ V}$, 50 Hz , 50 kVA transformer has full load copper loss of 1600 W and iron loss of 1800 W . Estimate transformer efficiency at: (05)
- i) Full load and 0.7 lagging p.f
 - ii) Half load and 0.85 lagging p.f

OR

- a) Write a short note on B-H curve. (05)
- b) Draw the neat connection diagram and explain the procedure for determining voltage regulation and efficiency by direct loading method for transformer having ratings 1 kVA , $230/115\text{ V}$, 1 phase , 50 Hz . Also write proper ranges of meters used. (05)

- Q. 5 a) What is series resonance? Obtain the expression for resonant frequency. (05)

- b) Define the following in case of an AC quantity:
Average value, RMS value, instantaneous value, form factor, peak factor

OR

- a) Define: (05)
- i) Impedance
 - ii) Admittance of circuit and sketch impedance and admittance triangle.

- b) A circuit consisting of resistance of 20Ω and inductance of 0.1 H in series, is connected across single phase 220 V , 50 Hz supply: (05)

Calculate:

- i) Current drawn
 - ii) P.f.
 - iii) Power consumed by circuit
- Q. 6** a) Why earthing is necessary? Write a brief note on any one type of earthing with sketch. (05)
- b) Write a detailed note on LED. (05)

OR

- a) State and explain various charges included in electricity bill. (05)
- b) State various types of electric wiring. Explain any one. (05)

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