*Total number of printed pages:4*

**UG/1st/UEE101**

**2021**

# BASIC ELECTRICAL ENGINEERING

*Full Marks: 100*

Time: Three hours

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

*Answer **any five** questions.*

1. a) Write the SI units of the following quantities ---

   (i) Magnetomotive force
   (ii) Current density
   (iii) Permeance
   (iv) Reluctance
   (v) Resistivity

   **1×5=5**

   b) Write five similarities between electric circuit and magnetic circuits. **5**

   c) An iron ring has a mean diameter of 15 cm, a cross-section of 20 $cm^2$ and an air-gap of 0.5 mm cut in it. It is uniformly wound with 1500 turns of insulated wire and a magnetizing current of 1A produces a flux of 1 mWb. Neglecting the effect of magnetic leakage calculate -- **10**

   (i) reluctance of the magnetic circuit
   (ii) relative permeability of iron.

2. a) Write the Faraday's laws of electromagnetic induction. **5**

   b) What are the main parts of a DC generator ? **5**

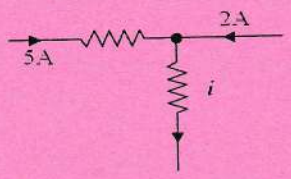
   c) An ideal 50 *kVA* transformer has 500 turns on the primary winding **10**

and 40 turns on the secondary winding. The primary is connected to 3000V, 50Hz supply. Calculate --

(i) primary and secondary currents on full-load
(ii) secondary emf
(iii) the maximum core flux

3. a) State Kirchhoff's current law and Kirchhoff's voltage law.

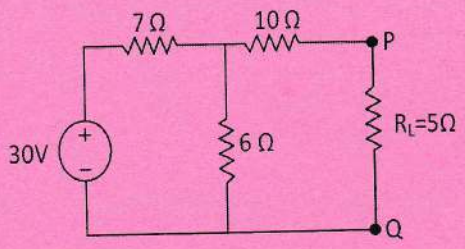
Find the current '*i*' in the given network.




4+1=5

b) State the maximum power transfer theorem. Prove the condition for maximum power transfer to a load resistance of a network. 5

c) For the given network, calculate the current through $\mathbf{R_L}$ using Thevenin's equivalent circuit. Also verify your result using Norton's equivalent circuit.

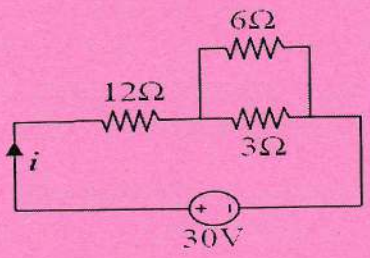



10

4. a) Write the statement of Ohm's law. Is there any relation between temperature and resistance of a material ? 5

b) Three resistors 3Ω, 6Ω and 9Ω are connected in star configuration. Find the equivalent delta for this star network. **5**

c) In the given circuit, estimate power loss in the 6Ω resistor. Also find the total power supplied and total power consumption.




**10**

5. a) Draw the following vectors and represent them in the polar form

$(i)\ \boldsymbol{A} = -5 + j5$

$(ii)\ \boldsymbol{B} = -8 - j6$

**5**

b) Compute the Average and RMS values of the square voltage wave shown below –

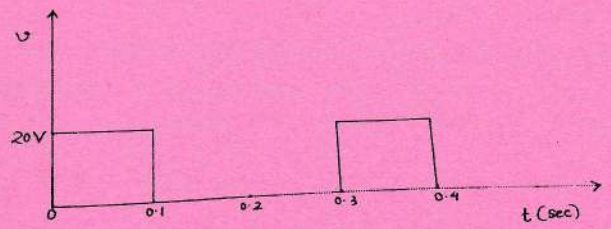



fig (i)

**5**

c) A resistance of 20Ω, an inductance of 0.2H and a capacitance of **2×5=10**

100μF are connected in series across 220V, 50 Hz mains. Determine the following --

(i) impedance
(ii) current
(iii) Voltage across R, L and C
(iv) Power in watts
(v) Power factor

6. a) What is meant by Phase sequence? Write some advantages of three phase system over single-phase system. **5**

b) Derive the relationship between the phase current and line current in three phase delta connected system. **5**

c) A balanced star-connected load of (8+j6) ohm per phase is connected to a balanced 3-phase 400V supply. Find the line current, power factor, active power and apparent power. **10**

7. a) A moving coil instrument has a resistance of 10Ω and gives full scale deflection when carrying a current of 50mA. How will you use this instrument to measure current of magnitude 100A and voltage of magnitude 750V ? Draw necessary diagrams. **5+5=10**

b) Two impedances are $Z_1 = (8 + j6)$ ohm and $Z_2 = (3 - j4)$ ohm are connected in parallel. If the total current of the combination is 25A, find the current taken and power consumed by each impedance. **10**