BASIC ELECTRICAL ENGINEERING

Course Code: UEE101
Time: 3 Hours
Full Marks: 100

Answer any five from the following:

1.

(a) Find the polar form of (-3+4j). Draw the phasor diagram of it. [5]

(b) Calculate:[5]

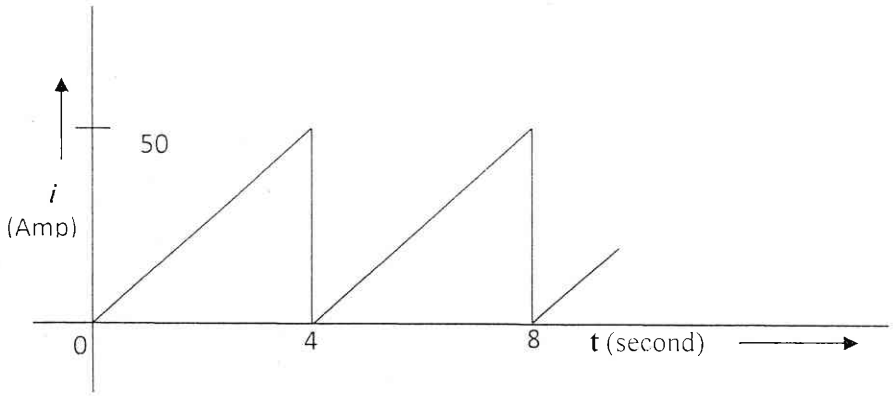
$$\frac{1+5.j}{2-7.j}$$

(c) A voltage $v(t)$ =141.4sin(314t+10°) volt is applied to a circuit and a steady current given by $i(t)$ =14.14sin (314t -20°) Ampere is found to flow through it. Determine (i) the power factor of the circuit (ii) the power delivered to the circuit. [10]

2.

(a) A sinusoidal alternating voltage has an r.m.s. value of 200 Volt and a frequency of 50 Hz. It crosses the zero axis in a positive direction when t=0. Determine the time when voltage first reaches the instantaneous value of 200 Volt. [5]

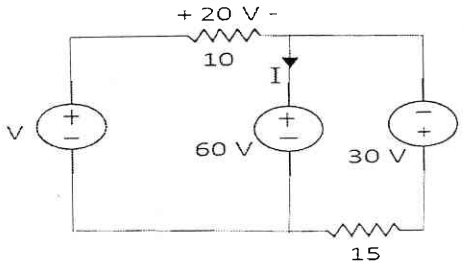
(b) Find the r.m.s. value of the waveform given in the following figure. [5]



(c) An impedance of (10+j15) Ω is connected in parallel with an impedance of (6-j8) Ω. The total current is 15 A. Calculate the currents flowing through individual impedances. Also calculate the total power. [10]

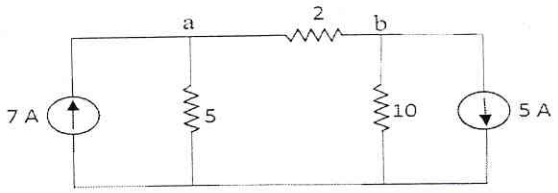
3.

(a) Using KVL and KCL, find the values of **V** and **I** in the given circuit. All resistances are in ohms. [5]



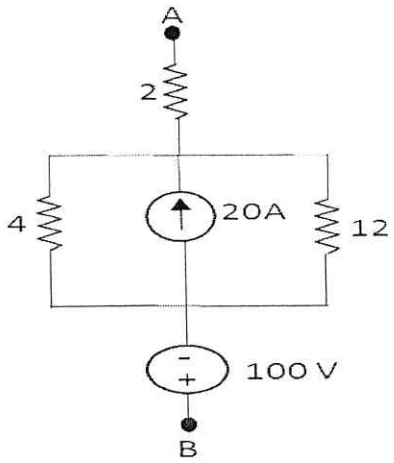
(b) State Maximum Power Transfer Theorem. Derive the condition for maximum power transfer. Also write the expression for maximum power. [5]

(c) Use Nodal analysis to find various branch currents in the circuit given below. All resistances are in ohm. [10]

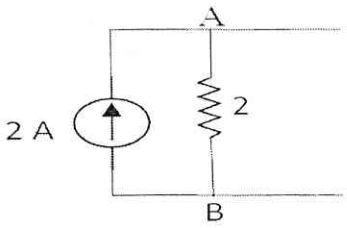


4.

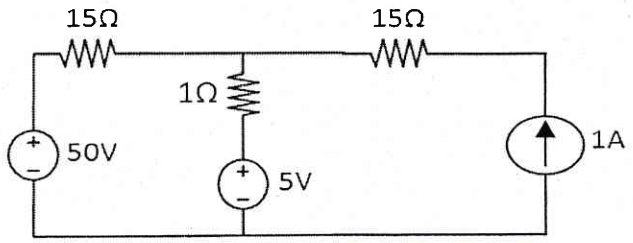
(a) Find the Thevenin's equivalent resistance as seen from the open – circuited terminals A and B of the circuit shown below. All resistances are in ohms. [5]



(b) Find the equivalent voltage source for the current source shown below. All resistances are in ohm. [5]



(c) Using Superposition Theorem find the branch currents in the circuit given below. **[10]**



5.

(a) Find an expression for the deflecting torque of a PMMC instrument. **[5]**

(b) What is the importance of fuse in electrical wiring systems? What do you mean by current rating and fusing current of fuse element? **[2+1.5+1.5=5]**

(c) A three phase load consists of three similar inductive coils, each of resistance 50Ω and inductance 0.3H. The supply is 415V, 50Hz. Calculate (a) the line currents, (b) the power factor, (c) the total power when the load is (i) star connected (ii) delta connected. **[5+5=10]**

6.

(a) Write the SI units of the following – **[5]**

(i) Reluctance
(ii) Permeance
(iii) Conductivity
(iv) Specific resistance
(v) Admittance

(b) How will you find the total reluctance of a composite magnetic circuit consists of three different materials with an air gap of 2 *mm*. Draw necessary diagrams.**[5]**

(c) An iron ring of mean length 100 *cm* with an air-gap of 2 *mm* has a winding of 500 turns. The relative permeability of iron is 600. When a current of 3A flows in the winding, determine the flux density. **[10]**

7.

(a) What are the assumptions of an ideal transformer? Draw the phasor diagram of an ideal transformer on no load. Derive an expression for the emf equation of a single phase transformer. **[3+3+4=10]**

(b) A single phase 50Hz transformer has 20 primary turns and 273 secondary turns. The net cross sectional area of the core is 400 cm^2. If the primary winding is connected to 230V supply, find (i) peak value of flux density in the core (ii) voltage induced in the secondary winding. **[10]**