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MID TERM EXAMINATION – November 2024

Programme	: B.Tech.	Semester	: Interim Semester 2024-25
Course Title	: Electric Circuits and Systems	Course Code	: EEE1001
Date/Session	: 6 Nov 2024/Session II	Slot	: B21+B22+B23
Time	: 1 ½ hours	Max. Marks	: 50

Answer all the Questions

Q.No.	Sub Sec.	Question Description	Marks
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- 1 (a) Calculate the the total current supplied by the battery shown in Fig.1.

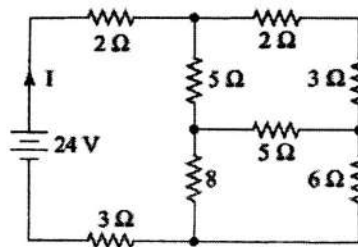


Fig.1.

- 1 (b) Determine v_x in the given circuit shown in Fig.2.

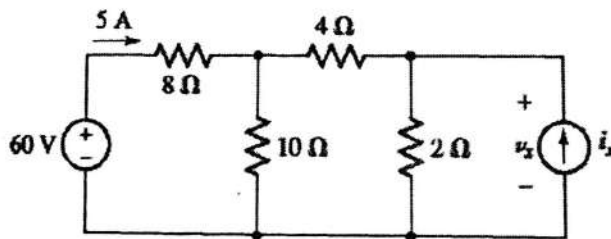


Fig.2.

- 2 (a) Determine the current through the load resistance connected across the terminals A and B using mesh analysis shown in Fig.3.

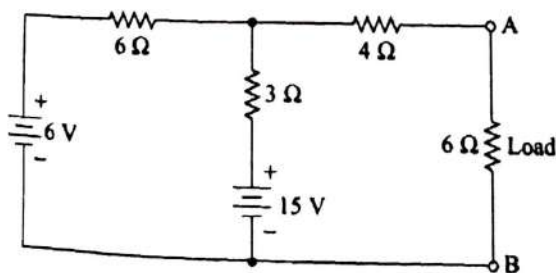


Fig.3.

- 2 (b) State Superposition theorem.

Calculate the value of load resistance R_L for which maximum power transfer will occur from source to load. Also calculate the value of maximum power in the given circuit shown in Fig.4.

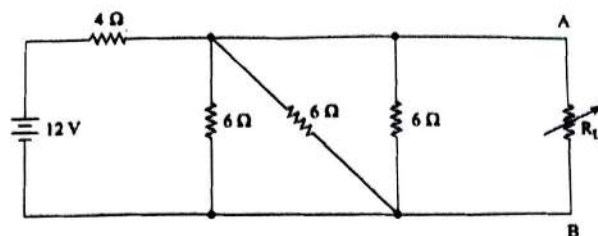


Fig.4.

- 3 (a) Show that current in a pure inductive circuit lags the voltage by 90° .
 3 (b) What should be the value of R for which a current of 25 A will flow through it in the given circuit shown in Fig.5.

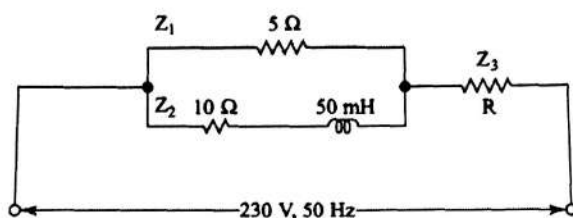


Fig.5.

- 4 (a) An $R-L-C$ series circuit has $R = 10 \Omega$, $L = 0.1 \text{ H}$, and $C = 8 \mu\text{F}$. Calculate the resonant frequency.
 4 (b) Consider a linear time inverse system given by

$$\frac{d^4 y(t)}{dt^4} - 9 \frac{dy(t)}{dt} + 14y(t) = \frac{dx(t)}{dt} + 2x(t)$$

$$x(t) = e^{-2t} u(t)$$

Find natural response, forced response, and total response for initial condition: $y(0) = 5$, $\frac{dy(0)}{dt} = 0$.

- 5 (a) A circular coil of radius r metres is carrying a current of I Amperes. Determine the magnetic field strength H at a point P which is situated at a distance of d metres from the centre of the coil. Also, determine the field strength at the centre of the coil.
 (b) An iron ring with permeability 2000 has a mean length of an iron path of 1 m and has a uniform cross-sectional area of 10 cm^2 . It is wound with two magnetizing coils in a manner such that the current flowing through the two coils produce flux in opposite directions. A cut in the ring creates an air gap of 0.1 cm. Calculate the flux.