



Printed Pages : 7

EEE-101

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2301

Roll No.

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B. Tech.

(Only for the candidates admitted/Readmitted in the session 2008-09)

(SEM. I) EXAMINATION, 2008-09

ELECTRICAL ENGINEERING

Time : 3 Hours]

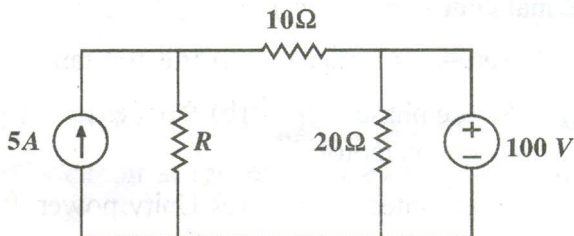
[Total Marks : 100

SECTION - A

1 Attempt all the parts of the following : $10 \times 2 = 20$

(Fill in the blanks/choose/match)

- (i) For the circuit shown in the following figure, the value of R such that the same amount of power is supplied to the 10Ω resistance by the current and by the voltage source will be _____.



- (ii) Maximum transmission voltage in India is

- (a) 220 kV (b) 400 kV
(c) 765 kV (d) 1200 kV



(iii) The instantaneous voltage and current for an ac circuit are $v = 155.6 \sin 377t$ V,

$i = 7.07 \sin(377t - 36.87^\circ)$ A. Represent these in a phasor diagram.

(iv) A voltage source of 100 V has internal impedance 2Ω and supplies a load having that same impedance. The power absorbed by the load is _____.

(v) A moving coil ammeter has a full scale deflection of $50 \mu A$ and a coil resistance of 100Ω . The value of the shunt resistance required for the instrument to be converted to read a full - scale reading of 1 A will be _____.

(vi) If W_1 , W_2 and W_3 are the readings of three wattmeters used to measure the power in 3-phase, 4-wire circuit, the total power of load circuit will be _____.

(vii) Match the following (marks will be awarded if all matching are correct) :

(i) Series resonance (a) Electric fan

(ii) Single phase induction motor (b) Condenser

(iii) Overexcited synchronous motor (c) Unity power factor

(iv) Eddy current loss (d) Thin laminated plates

(viii) A single phase transformer working at maximum efficiency. The copper losses are 100 W, the iron losses would be _____.



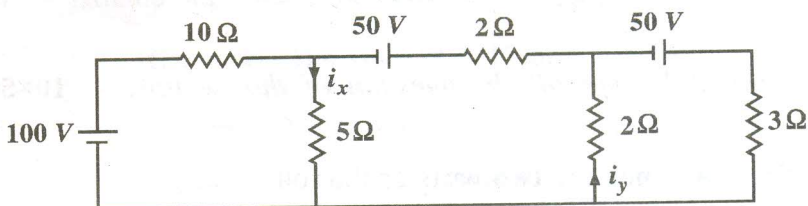
(ix) The current drawn by a 120V dc motor of armature resistance 0.4Ω and back e.m.f. 112 V is _____.

(x) The rotor speed of a six pole 50 Hz induction motor is 960 rpm the percentage slip is
 (a) 3% (b) 4% (c) 5% (d) 2%

SECTION - B

2 Attempt any **three** parts of the following : $10 \times 3 = 30$

(a) (i) Determine the current i_x and i_y in the following network. State theorem used.



(ii) What do you understand by unilateral and bilateral elements ? Give examples.

(b) Derive the quality factor Q_p of the parallel RLC circuit at resonance. Define band width for the same.

(c) What is the necessity and advantage of 3-phase system ? Derive $V_L = \sqrt{3} V_{ph}$ for star connected system.



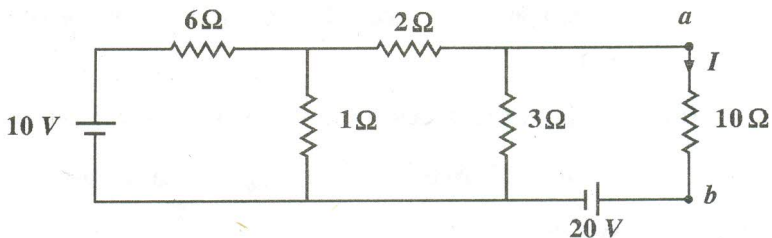
- (d) (i) Describe the analogies that can be made between electric and magnetic circuit regarding the following items : driving force, field intensity, impedance drops, equivalent circuits.
- (ii) Explain Hysteresis and eddy current loss. How they are minimized ?
- (e) Briefly discuss the principle of operation of alternator and also give its applications. Draw V curve for synchronous motor.

SECTION - C

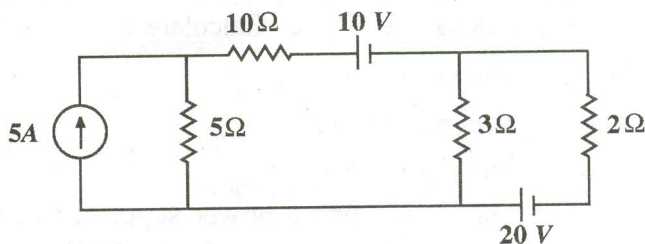
Note : Attempt all the question of this section. $10 \times 5 = 50$

3 Attempt any **two** parts of the following :

- (i) Replace the network of following figure to the left of terminals **ab** by its Thevenin equivalent circuit. Hence determine **I**.



- (ii) Find the current in, and voltage across, the $2\ \Omega$ resistance in the following fig.



- (iii) State and prove Maximum Power Transfer Theorem.

4 Attempt any **two** parts of the following :

- (i) Given $v = 200 \sin 377 t\ V$ and

$$i = 8 \sin(377 t - 30^\circ)\ A \text{ for an ac circuit.}$$

Determine : (a) The power factor (b) True power
(c) Apparent power (d) Reactive power.

- (ii) A 46 mH inductive coil has a resistance of $10\ \Omega$.

- (a) How much current will it draw if connected across a 100 V, 60 Hz, source ?
(b) Determine the value of the capacitance that must be connected across the coil to make the power factor of the overall circuit unity.

- (iii) How is the phasor of a sinusoidal quantity defined ?
Mention specifically the information that is conveyed by the phasor about the corresponding sinusoidal function.



Attempt any **two** parts of the following :

- (i) A 3-phase voltage source has a phase voltage of 120 V and supplies star connected load having impedance $36 + j48 \Omega$ per phase. Calculate :
- (a) The line voltage
 - (b) The line current
 - (c) The power factor
 - (d) The total 3-phase power supplied to the load.
- (ii) Discuss the principle, construction and operation of moving iron type measuring instruments.
- (iii) Explain two wattmeter method to determine power in 3 phase system.

Attempt any **two** parts of the following :

- (i) Discuss the voltage structure of the electric power system. Give the concept of grid.
- (ii) The core of a magnetic circuit is of mean length 40 cm and uniform cross-sectional area 4 cm^2 . The relative permeability of the core material is 1000. An air gap of 1 mm is cut in the core, and 1000 turns are wound on the core. Determine the inductance of the coil if fringing is negligible.
- (iii) The ohmic values of the circuit parameters of a transformer, having a turns ratio of 5, are $R_1 = 0.5 \Omega$, $R_2 = 0.021 \Omega$, $X_1 = 3.2 \Omega$, $X_2 = 0.12 \Omega$, $R_c = 350 \Omega$, referred to the primary and $X_m = 98 \Omega$ referred to primary. Draw the approximate equivalent circuits of the transformer referred to secondary. Show the numerical values of the circuit parameters.



7 Attempt any **two** parts of the following :

- (i) Calculate the voltage induced in the armature winding of a 4-pole, lap wound dc machine having 728 active conductors and running at 1800 rpm. The flux per pole is 30 mWb. If the armature is designed to carry a maximum line current of 100 A, what is the maximum electro magnetic power developed by the armature ?
- (ii) A 4-pole, 3-phase induction motor is energized from a 60 Hz supply, and is running at a load condition for which the slip is 0.03. Determine : (a) Rotor speed, in rpm (b) Rotor current frequency, in Hz (c) Speed of the rotor's rotating magnetic field with respect to the stator frame, in rpm.
- (iii) Discuss the principle of operation of a single phase induction motor. How the motor is started ? Explain any one method of starting.
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