PAPER ID-411459

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM I) THEORY EXAMINATION 2021-22
BASIC ELECTRICAL ENGG

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

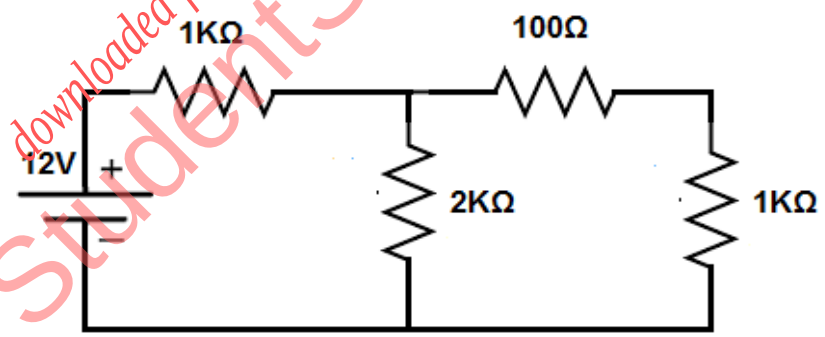
SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a.	What is the limitation of superposition theorem?
b.	Define linear and non-linear elements with example.
c.	Explain the term "dynamic impedance" in AC circuits.
d.	A series RLC circuit has R = 12Ω, L = 0.01 H and C =2.5 μF. Calculate the quality factor of the circuit.
e.	How the line current is related to phase current in 3-ϕ delta (Δ) connected circuit.
f.	What is the need of highly permeable core in transformer?
g.	How MMF is related to reluctance?
h.	What is the condition of maximum efficiency of transformer?
i.	How the synchronous speed is related to frequency of supply and number of poles?
j.	What is the function of slip rings in 3-ϕ induction motor?

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a.	What is the utility of thevenin's theorem. Draw the thevenin's equivalent circuit across the 2 kΩ resistor shown in Fig.1.  **Fig.1. Electric circuit**
b.	What are the various methods of power factor improvement? Discuss one of them in brief.
c.	A 3-ϕ, 500 V motor has a power factor of 0.4 (lagging). Two wattmeters are connected to measure the input and show the total input power to be 30 kW. Find out the readings of each wattmeter.
d.	A 40 kVA transformer has core loss of 400 W and full-load copper loss of 800 W. If the power factor of the load is 0.9 (lagging) then calculate the efficiency of transformer at full load.
e.	Why 1-ϕ induction motor is not self-starting? Explain different methods of starting of 1-ϕ induction motor.

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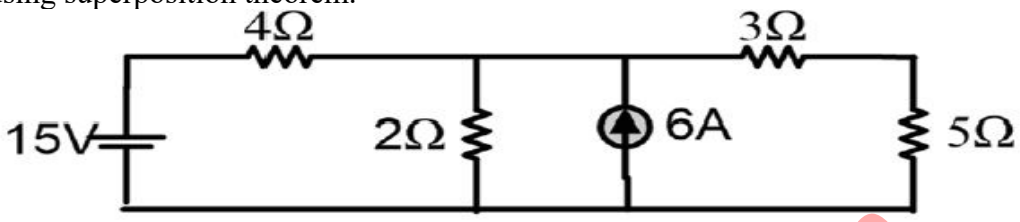
SECTION C

3. Attempt any *one* part of the following: 10x1=10

a.	Derive an expression of delta (Δ) to star (Y) transformation and star (Y) to delta (Δ) transformation with example.
b.	Determine the current flowing through 5Ω resistor in the following circuit (Fig.2) using superposition theorem.  **Fig.2. Electric circuit**

4. Attempt any *one* part of the following: 10x1=10

a.	Derive an expression of bandwidth in case of series resonating circuit. If the bandwidth of resonant circuit is 10 kHz and the lower half power frequency is 120 kHz. Find out the value of upper half power frequency and the quality factor of the circuit.
b.	Two impedances given by Z_1 = (10+j15) Ω and Z_2 = (6-j8) Ω are connected in parallel. If the total current supplied is 15 A, calculate the current and power absorbed by each branch.

5. Attempt any *one* part of the following: 10x1=10

a.	Derive the relation between line and phase voltages for a star-connected 3-ϕ balanced system. A balanced star-connected load of (12+ j9) Ω/phase is connected to 3-ϕ, 400 V supply. Calculate line current, power factor, and power drawn by it.
b.	Explain the construction of a permanent magnet moving coil (PMMC) instruments with a neat sketch.

6. Attempt any *one* part of the following: 10x1=10

a.	Derive an expression of EMF equation of transformer. The EMF per turn of 1-ϕ 10 kVA, 2200/220 V, 50 Hz transformer is 10. Calculate (i) the number of turns in primary and secondary, (ii) the net cross-sectional area of core for a maximum flux density of 1.5T.
b.	Explain the need of earthing of electrical equipment. What are the different methods of earthing?

7. Attempt any *one* part of the following: 10x1=10

a.	A 25 kW, 250 V DC shunt generator has armature and field resistances of 0.06 Ω and 100 Ω respectively. Determine the armature power developed when working as: (a) Generator delivering 25 kW output. (b) Motor taking 25 kW input.
b.	A 3-ϕ induction motor has 2 poles and is connected to 400 V, 50 Hz supply. Calculate the actual rotor speed and rotor frequency when the slip is 4%.

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