

**BASIC ELECTRICAL ENGINEERING
(ELEC 1001)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

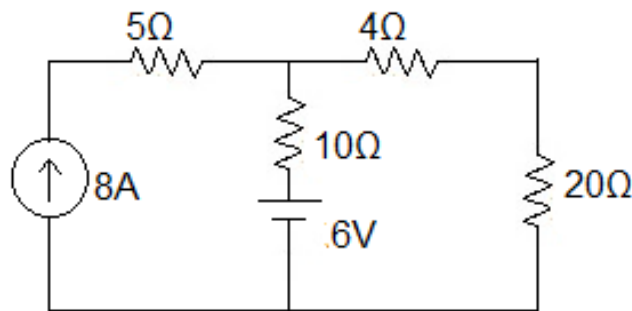
**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) For maximum power transfer, the Thevenin's equivalent resistance of the network must be equal to
(a) half of the load resistance (b) the load resistance
(c) Infinity (d) zero.
- (ii) For additive flux of two coils connected in series the equivalent inductance can be expressed as
(a) L_1+L_2-M (b) L_1+L_2+2M
(c) L_1+L_2+M (d) L_1+L_2-2M .
- (iii) Capacitor having lowest capacitance is
(a) air (b) paper
(c) mica (d) plastic
- (iv) Which of the following rule is used to determine the direction of rotation of D.C motor?
(a) Coloumb's Law (b) Lenz's Law
(c) Fleming's Right-hand Rule (d) Fleming's Left-hand Rule.
- (v) The electric field inside the hollow cylinder is
(a) zero (b) same as that on the surface
(c) less then that of the surface (d) infinite
- (vi) Inductive reactance of a coil of inductance 0.2H at 50 Hz is
(a) 62.8Ω (b) 628Ω
(c) 0.2Ω (d) 10Ω
- (vii) The efficiency of a transformer is maximum when
(a) copper loss is zero (b) iron loss is zero
(c) copper loss is 50% of the iron loss (d) copper loss is equal to iron loss.

- (viii) For a three phase, three wire system, the two wattmeters read 4000 Watts and 2000 Watts respectively. Calculate the power factor when both readings are positive?
(a) 1 (b) 0.5
(c) 0.866 (d) 0.6
- (ix) Starter in d.c. motor is used to
(a) reduce starting current (b) increase starting current
(c) increase the speed (d) reduce the speed
- (x) A 10 kW, 4P, star connected 50 Hz IM has a full load slip of 5%. What is the synchronous speed of the motor?
(a) 1200 rpm (b) 1500 rpm
(c) 1000 rpm (d) 3000 rpm

Group - B

2. (a) Find the current through 20Ω resistance in the circuit shown below using Superposition Theorem.



- (b) Prove the Maximum Power Transfer theorem for a DC network.
- (c) State Thevenin's theorem.
- 5 + 5 + 2 = 12**
3. (a) The armature of a 4 pole, 230V, wave wound generator has 400 conductors and runs at 400 rpm. Calculate the useful flux per pole.
- (b) Draw and explain the torque vs current characteristic of dc series motor.
- (c) A 220V series motor takes 10A and runs at 600 rpm. The total resistance is 0.8Ω . At what speed will it run, when a 5Ω resistance is connected in series and the motor taking same current at the same supply voltage.

4 + 4 + 4 = 12

Group - C

4. (a) A voltage of 90V dc is applied across two capacitors in series having capacitances of $50\mu\text{F}$ and $20\mu\text{F}$. Find the voltage drop across each capacitor. What is the charge in coulomb in each capacitor?

(b) State and prove Gauss's law.

6 + 6 = 12

5. (a) An iron ring 20 cm in diameter and 10 cm² in cross-section is wound with 100 turns of wire. For a flux density of 1.5 Wb/m², and permeability of 500, find the exciting current.

(b) Write down the similarities and dissimilarities of magnetic circuit and electric circuit.

(c) State and prove the Ampere's circuital Law.

4 + 4 + 4 = 12

Group - D

6. (a) Find the average and rms value of the waveform shown below:



(b) A series circuit consisting of a resistor of 100 Ω , capacitor of 25 μF and an inductor of 0.15 H is connected across a 220V, 60Hz supply. Calculate (i) impedance (ii) current (iii) total power consumed by the circuit (iv) power factor (v) resonant frequency (vi) current under resonance condition.

(2 + 2) + 8 = 12

7. (a) Three equal impedances each of $(8 + j10) \Omega$ are connected in star. This is further connected to 440V, 50 Hz three phase supply. Calculate the (i) phase voltage (ii) phase angle (iii) phase current (iv) line current (v) active power

(b) Show that 3- phase power can be measured by using two wattmeter. Also derive the power factor equation for the above case.

5 + (5 + 2) = 12

Group - E

8. (a) Derive the expression for the EMF induced in a transformer.

(b) Draw the phasor diagram of a single phase transformer at leading power factor.

(c) A 25 kVA, 2000/200V transformer the iron and full load copper losses are 350 W and 400 W respectively. Find the efficiency at unity p.f. at (a) full load (b) half load.

4 + 4 + (2 + 2) = 12

B.TECH/AEIE/CSE/ECE/IT/1ST SEM/ELEC 1001(BACKLOG)/2020

9. (a) A three-phase 50 Hz induction motor having 6 pole has a slip of 0.8 % at no load and 2 % at full load. Calculate:
(i) Synchronous speed. (ii) No load speed. (iii) Full load speed. (iv) Frequency of rotor current at standstill. (v) Frequency of rotor current at full load.
(vi) Frequency of rotor current at no load.
- (b) Explain the principle of operation of a 3-phase Induction Motor.

6 + 6 = 12

Department & Section	Submission Link
AEIE/CSE/ECE/IT Old Syllabus	https://classroom.google.com/c/MjM3Mjc2NDU1OTk0/a/MjcxMDIxMTI4MDMz/details