

JUNE 2008

Code: DE05
Time: 3 Hours

Subject: ELECTRICAL ENGINEERING
Max. Marks: 100

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or best alternative in the following. (2x10)

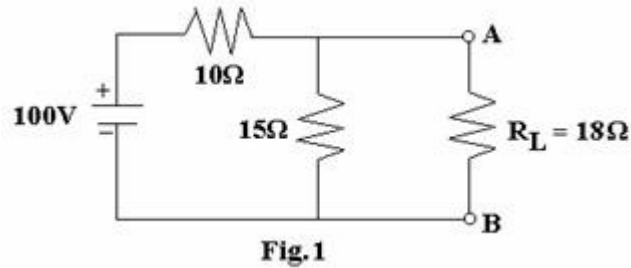
- a. In ac circuit the product of voltage and current is known as
Real power. (A) Power. (B)
power. (C) Resistive
(D) Apparent power.
- b. A network that does not have either voltage or current sources is called
(A) Active network. (B) Passive network.
(C) Resistive network. (D) Dummy network.
- c. The Power- factor at resonance in R-L-C circuit is
(A) Zero.
(B) Unity. (C) 0.5
lagging. (D) 0.5 leading.
- d. In an 8 – pole wave connected motor armature, the number of parallel paths are
(A) 8 (B) 4
(C) 2 (D) 1
- e. Transformer core is laminated to
(A) Reduce the copper losses. (B) Reduce the core losses.
(C) Reduce the eddy current losses. (D) None of these.

- f. The relation between frequency, speed and number of poles is given by
 (A) $N_s = 120 \times f / p$. (B) $f = 120 \times N_s / p$.
 (C) $N_s = 120 \times p / f$. (D) $N_s = f \times p / 120$.
- g. Star – delta starter of an induction motor
 (A) Inserts resistance in rotor circuit. (B) Inserts resistance in stator circuit.
 (C) Applies reduced voltage to rotor. (D) Applies reduced voltage to stator.
- h. Stator core of an induction motor is made of
 iron. (A) Laminated cast
 (B) Mild steel. (C) Silicon steel
 stampings. (D) Soft wood.
- i. Watt hour is the unit of
 power. (A) Electric
 (B) Electric capacity. (C) Electric
 energy. (D) Electric charge.
- j. A battery is a source of
 (A) DC voltage. (B) 1 ϕ AC voltage.
 (C) 3 ϕ AC voltage. (D) AC or DC voltage.

**Answer any FIVE Questions out of EIGHT Questions.
 Each question carries 16 marks.**

- Q.2** a. State the following:
 (i) Thevenin's Theorem (ii) Norton's
 Theorem
 (iii) Kirchoff's
 laws (8)

- b. For the circuit shown in Fig.1, find the current in the load resistance $R_L=18\Omega$ and the voltage across it by Norton's theorem and verify the result by applying Thevenin's Theorem. (8)



- Q.3** a. A series AC circuit connected to 230V, 50Hz mains consists of a non-inductive resistance of 100 Ω and inductance of 100mH and a capacitance of 20μF. Calculate – impedance, current, power factor and power. (8)

- b. A balanced star connected load is supplied from a symmetrical three-phase, 400V (line-to-line) supply. The current in each phase is 50A and lags behind the phase voltage by 30°. Find phase voltage, phase impedance and active and reactive power drawn by the load. (8)

- Q.4** a. Based on the core construction, explain the two types of transformer. (8)

- b. The emf per turn of 3300 /395, 50Hz single- phase core type transformer is 7.5V, if the maximum flux density is 1 tesla, then find a suitable number of primary and secondary turns and the net cross-sectional area of the core. (8)

Q.5 a. Explain, the process of commutation in a dc machine. Explain what are inter-poles and why they are required in a dc machine. (6)

b. A 6- pole lap wound series motor has 60 slots; each slot consists of 12 conductors. If the armature current is 50 A, calculate the total torque in Nw -m. Flux per pole is 20×10^{-3} wb. (4)

c. Give reasons, why, starters are required for starting a motor. (6)

Q.6 a. Explain capacitor start and capacitor run single- phase induction motor. (8)

b. Explain the term slip in an induction motor. (4)

c. A 12 pole, 50 Hz induction motor is running at 450 rpm. Calculate the % slip of the motor on account of forward field. (4)

Q.7 a. What are the disadvantages of low power factor? How can it be improved? (8)

b. Give reasons, why the following motors are used in the particular applications indicated against them. Synchronous motors – power-factor improvement, DC shunt motors – lathes, DC series motors- lifts and cranes, Cumulative compound motor – rolling mills. (8)

Q.8 a. What are the advantages and disadvantages of high voltage DC transmission? (8)

b. A 100 MW power station delivers 100MW for 2 hours, 50 MW for 6 hours and is shut down for rest of each day. It is also shut down for maintenance for 45 days each year. Calculate its annual load factor. (8)

Q.9 a. State a few applications of solar energy. Also explain the structure of a solar photovoltaic cell. (2+6)

biofuels. b. Write a note on
(8)