

DipIETE – ET (OLD SCHEME)

JUNE 2010

Code: DE05

Subject: ELECTRICAL ENGINEERING

Time: 3 Hours

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 the best alternative in the following: (2 × 10)

- a. Kirchoff's current law is applicable only to _____.
- (A) closed loops in a network (B) junctions in a network
(C) electronic circuits (D) electric circuits
- b. A capacitor-start capacitor-run induction motor is basically a _____ motor.
- (A) two phase (B) ac series
(C) commutator (D) synchronous
- c. The dynamic impedance of an R-L and C parallel circuit at resonance is _____.
- (A) C/LR (B) L/CR
(C) LC/R (D) R/LC
- d. The power factor of an a.c. circuit is equal to _____.
- (A) cosine of the phase angle (B) sine of the phase angle

Each question carries 16 marks.

Q.2 a. Define the following circuit elements: (6)

- (i) Resistance.
- (ii) Capacitance.
- (iii) Inductance.

b. Derive the value of the equivalent resistance when a number of resistances are connected in series. (4)

c. In the single loop circuit of the fig.1 given below, find the current I. (6)

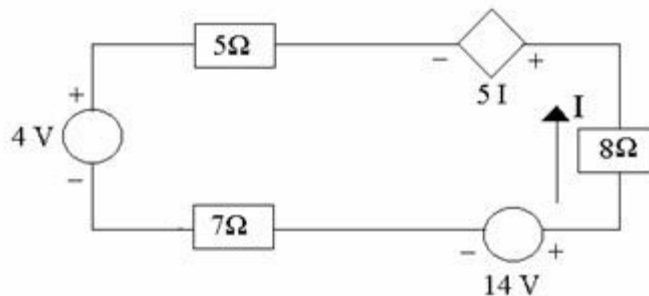


Fig.1

Q.3 a. A circuit consists of a pure resistance of $50\ \Omega$ and is connected across ac supply $v = 250\sin 314t$. Calculate current in the resistance power consumed by the resistance. Also write the expression for instantaneous value of the current. (8)

b. A pure capacitive circuit offers $31.4\ \Omega$ capacitive reactance at 25 Hz. Calculate how much current does the circuit draw if its terminals are connected to 230V 50Hz supply? (8)

Q.4 a. Explain the construction and working principle of a DC motor. (8)

b. A shunt motor takes a current of 40 A from 230 V supply and runs at a speed of 1100rpm. Find the torque developed by the armature if the armature and the shunt field resistances are 0.25 Ω and 23 Ω respectively. (8)

Q.5 a. Draw and explain the equivalent circuit of a single phase ideal transformer. (8)

b. A 500kVA transformer has 95% efficiency at full load and also at 60% of full load both at unity power factor.
(i) Separate out the transformer losses.
(ii) Determine the transformer efficiency at 75% full load unity power factor. (8)

Q.6 a. Explain split – phase and shaded pole single phase motors with suitable diagrams. (8)

b. The full load speed of a 3- phase, 230V 4-pole, 50 Hz induction motor is 1445 rpm. Determine the synchronous speed, slip and rotor frequency. (8)

Q.7 a. Write a note on biofuels. (8)

b. Give two applications of Shaded pole motor, DC shunt motors, DC series motors, and Capacitor start motors. (8)

Q.8 a. Explain a PV cell with a suitable diagram. (8)

b. A power station has a maximum demand of 15000kW. The annual load factor is 50% and capacity factor is 40%. Determine the reserve capacity of the plant. (8)

Q.9

Write notes on:

(i) Application of DC series motors.

(ii) Power factor and its improvement. **(8+8)**