Code No.: 4349/N

FACULTY OF ENGINEERING

B.E. II/IV Year (CSE) II Semester (Main) Examination, April/May 2008

(New)

ELECTRICAL CIRCUITS AND MACHINES

Time : 3 Hours] [Max. Marks : 75

Answer **all** *questions of* Part A.

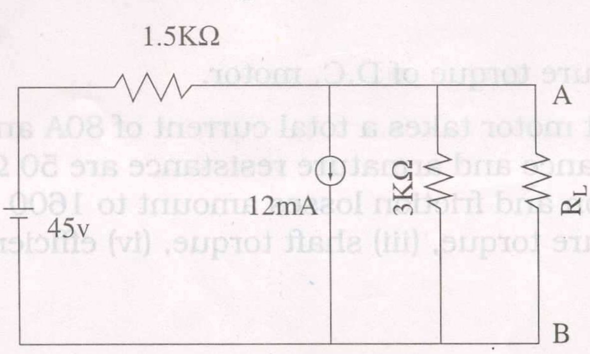
Answer **five** *questions from* Part B.

Part A – (Marks : 25)

1. At what speed does the revolving field of 3ϕ induction motor rotate? On which factors does the speed depend? 3
2. A 3ϕ, 50 Hz, 4-pole Induction motor has a full load speed of 1440 rpm. Find % slip. 2
3. A sine wave has a peak value of 25 V. Determine the following: (a) RMS, (b) Peak to peak, (c) Average values. 3
4. A voltage of $v(t) = 100 \sin \omega t$ is applied to a circuit. The current flowing through a circuit is $i(t) = 15 \sin(\omega t - 30°)$. Determine the active power delivered to the circuit. 3
5. Draw the speed v/s torque characteristic of d.c. shunt motor. 2
6. Why is a d.c. series motor used to start heavy loads? 2
7. Why is single phase motor not self starting? 3
8. What are the conditions for voltage build-up of a d.c. shunt generator? 3
9. Why are iron losses constant at all loads in a transformer? 2
10. Why is the efficiency of a transformer generally high? 2

Part B – (Marks : 5 × 10 = 50)

11. (a) Find the voltage across R_L in Fig. 1 when (i) R_L = 1 kΩ, (ii) R_L = 2kΩ. 6



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(b) A current has the following steady values (in amperes) for equal intervals of time, changing instantaneously from one value to the next : 4

0, 10, 20, 30, 20, 10, 0, –10, –20, –30, –20, –10, etc.

Calculate the rms value of current and form factor.

12. (a) The power input to a 2000 V, 50 Hz, 3-ϕ motor running on full load at an efficiency of 90% is measured by two wattmeters which indicate 300 kW and 100 kW respectively. Find (i) the input, (ii) the power factor and (iii) the line current and output. 5

(b) A single phase 400/2000 V transformer has a 225Ω resistor connected across its *hv* winding. Calculate the primary current when the circuit is supplied at 400 V. 5

13. (a) A 500 kVA, 3800/400 V, 50 Hz single phase transformer has the following data: $R_1 = 0.114\ \Omega$, $X_1 = 0.459\ \Omega$, $R_2 = 0.00102\ \Omega$, $X_2 = 0.00416\ \Omega$. Find the percentage voltage regulation of the transformer when supplying full-load current at a P.f. of 0.8 lagging. 4

(b) In a no-load test of a single-phase transformer, the following test data were obtained :

Primary voltage : 220 V,	Secondary voltage : 110 V
Primary current : 0.5 A,	Power input : 30 W

Find (i) the turns ratio, (ii) the magnetising component of no-load current, (iii) the iron loss component of no-load current, (iv) iron loss. The resistance of primary winding is 0.6 Ω. 6

14. (a) Explain the principle of operation of D.C. generator. Also derive the EMF equation of it. 5

(b) The resistance of field circuit of a shunt-excited d.c. generator is 200 Ω. When the output of the generator is 100 kW, the terminal voltage is 500V and the generated emf 525V, calculate (i) the armature resistance, (ii) the value of generated emf when the output is 60 kW, if the terminal voltage is 520 V. 5

15. (a) Derive the Armature torque of D.C. motor. 4

(b) A 220V DC shunt motor takes a total current of 80A and runs at 800 rpm, shunt field resistance and armature resistance are 50 Ω and 0.1 Ω respectively. If iron and friction losses amount to 1600 W, find (i) copper losses, (ii) armature torque, (iii) shaft torque, (iv) efficiency.

16. (a) Explain the methods of starting slip ring induction motor. 5

(b) A 6-pole, 50 Hz, 3 ϕ induction motor runs at 960 rpm when the torque on the shaft is 200 N-m. If the stator losses are 1500 W and friction and windage losses are 500 W, find (i) rotor cu loss and (ii) efficiency of the motor. 5

17. Write short notes on the following : 4+4+2=10

(a) Split-phase induction motors

(b) Capacitor-start capacitor-run motor

(c) Stepper motor.