

## Problems of Magnetic induction and transformers

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1) A 680–turn coil of wire 17 cm in diameter is in a magnetic field that changes from 0.3 T to –0.3 T in 7 ms. The axis of the coil is parallel to the field. Find the voltage induced in the coil.

*Answer:* 1323 V

2) A 3 cm diameter coil has 890 turns and a resistance of  $2.2 \Omega$ . A magnetic field perpendicular to the coil is  $B(t) = 5t^2 - 5t$ , where  $B$  is in Tesla and time is in seconds. Find the current induced at 5 s and 9 s.

*Answer:* –12.87 A, –24.31 A

3) A 770–turn coil rotates with a frequency of 110 Hz in a magnetic field of 7.6 T. Find the peak value of the induced *EMF* if the cross section area of the coil is  $80 \text{ cm}^2$ .

*Answer:* 32.4 kV

4) A conductor rod 45 cm long is moving perpendicular to a magnetic field of 8.3 T with a speed of 19 m/s. Find the induced *EMF* between the ends of the rod.

*Answer:* 70.97 V

5) Determine the voltage on the secondary coil of a transformer if the voltage on the primary coil is 3080 V and the ratio of primary turns to secondary turns is 14:1.

*Answer:* 220 V

6) A step–up transformer has 130 turns on its primary coil and 1820 turns on its secondary. Find the secondary voltage if the primary voltage is 110 V. If the primary current is 11.62 A, what is the secondary current?

*Answer:* 1540 V, 0.83 A

7) A step–down transformer operates on a 2375 V line and supplies a load with 13.49 A. The ratio of the primary turns to the secondary turns is 19:1. Find the secondary voltage and the primary current.

*Answer:* 125 V, 0.71 A

8) A transformer for an electric razor converts a 220 V input to an 18.33 V output. **a)** If the primary coil has 2040 turns, how many turns does the secondary have? **b)** If the secondary current is 3.84 A how much current is drawn from the 220 V outlet?

*Answer:* **a)** 170 turns, **b)** 0.32 A