

R09

Code: 9A02308

B.Tech II Year I Semester (R09) Supplementary Examinations December 2015

ELECTRICAL MACHINES - I
(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 (a) Prove that the energy and co-energy in a linear magnetic system are given by identical expressions.
(b) Two coupled coils have self and mutual inductances of $2/(1+x)$ and $(1-x)$ respectively. If currents through the coils are 6 A and -3 A, find the input energy supplied to increase 'x' from 0 to 1 cm.
- 2 What are the different types of armature windings of DC machines? Give their relative merits and demerits, and applications of the respective windings.
- 3 (a) Explain the 'period of commutation'. What is its expression?
(b) A 20 kW, 4-pole shunt generator has terminal voltage of 250 V when running at 400 rpm. The armature has a resistance of 0.16Ω and consists of 652 conductors which are lap-wound. The diameter of the pole-shoe circle is 0.38 m. The poles are 0.2 m long and subtend an angle of 60° . Calculate the flux density in the air-gap. Neglect the shunt field current.
- 4 (a) Mention the reasons for compounding dc generator.
(b) A 4-pole, 250 V, dc long-shunt compound generator supplies a load of 10 kW at the rated voltage. The armature, series-field and shunt-field resistances are 0.1Ω , 0.15Ω and 250Ω respectively. The armature is lap-wound with 50 slots each slot containing 6 conductors. If the flux per pole is 50 mWb, calculate the speed of the generator.
- 5 What is the experimental procedure to obtain the load characteristics of a separately-excited dc generator? Explain.
- 6 (a) Deduce the condition for developing maximum power by a dc motor.
(b) A 6-pole lap-wound shunt motor has flux per pole of 2×10^{-2} Wb in the air-gap between pole-shoe and armature. The armature is wound with 500 conductors having a total length of 24,000 cm and cross-sectional area of 0.07 cm^2 . Find the speed of the motor with 100 V on terminals and 120 A in the line.
- 7 (a) Distinguish between 3-point and 4-point starters.
(b) Explain the functions of NVC, OLR and 'Copper Strip' in a 3-point starter.
- 8 With neat diagram explain how the Back to Back test will be conducted on two dc machines? Give all calculations assuming equal constant losses.
