

**R09****Code: 9A02308**

B.Tech II Year I Semester (R09) Supplementary Examinations June 2016

**ELECTRICAL MACHINES - I**  
(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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- 1 (a) Derive an expression for force on movable part in a doubly-excited linear system.  
(b) A rectangular iron core is wound with a coil of 1000 turns on one limb and the other limb is cut with an air-gap of 0.5 cm. The length of the iron path is 120 cm and area of cross-section of iron is  $5 \times 5 \text{ cm}^2$ . The current through the coil is 3A. Calculate and compare the field-energy stored and field-energy density in iron as well as in air-gap. Neglect fringing and leakage of flux and assume relative permeability of the iron material as 1500.
- 2 With the help of neat sketches show the constructional features of a dc machine and brief the function of each component of the machine.
- 3 Discuss the following methods of improving commutation in detail:  
(a) Increasing the brush contact resistance  
(b) Shifting the brushes.
- 4 A series generator of total resistance of  $0.5 \Omega$  is running at 1000 rpm and delivering 5 kW at terminal p.d. of 100 V. If the speed is raised to 1500 rpm and the load is adjusted to 8 kW, find the new current and terminal p.d. Assume that the machine is working on the straight line portion of the characteristic. The flux is proportional to the current and the emf generated is proportional to the product of flux and speed.
- 5 What is the experimental procedure to obtain the load characteristics of dc series generator? Explain.
- 6 (a) What is the significance of back emf and how it will act as a regulating mechanism?  
(b) A 500 V, dc shunt motor has armature resistance of  $0.09 \Omega$  and field resistance of  $220 \Omega$ . Determine the back emf when giving an output of 8.5 kW at 87 % efficiency.
- 7 (a) What are the advantages and disadvantages of 'applied voltage control method' of speed control?  
(b) A 230 V dc series motor has resistance of  $0.2 \Omega$ . At a speed of 1800 rpm, it takes a current of 40 A. Find the resistance to be added to limit the speed to 3600 rpm, when the motor draws a current of 10 A. Assume that the flux is linear to current between 10 A and 40 A.
- 8 List out the different tests that can be carried out on dc machines. Mention the purposes, advantages and disadvantages of each test.

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