



This Exam measures the ILOs [a.3, a.15, b.5, b.14, b.15, c.5, and c.13]

Answer the following questions: In each question, draw the circuit diagram and write the necessary equations to clarify your answer

Question One: (20 Mark) [measures the ILOs of a1, b.5, b.14, and c.13]

- a) **Draw** the connection diagram to perform load characteristic curve of separately-excited DC generator. [5Mark/ a.3.1 and c.13.1]
- b) **Show**, experimentally, how you can **perform** load test of separately-excited DC generator. **Interpret** your results. [5Mark/ b.5.1, b.14.2 and c.13.2]
- c) **Explain** three reasons behind failing of self-exciting DC machine then **suggest** the suitable action/ actions required to build the machine voltage. [5Mark/ a.15.4, b.5.1 and c.13.4]
- d) From magnetization characteristic at $I_f = 1.2A$, $E_a = 225 V$ at 1000 rpm. **What will be** the terminal voltage at speed 950 rpm? [5Mark/ b.14.2 and c.13.4]

Question Two: (20 Mark) [measures the ILOs of a15, b.5, b.14, c.13 and c.5]

- a) **Show**, experimentally **how can you** start DC shunt motor. **Explain** different methods used to control the speed of DC shunt motor and **discuss** the advantages/ disadvantages of each one. [7Mark/ a.15.1, b.14.1 and c.5.2]
- b) A 200V, 10 kW DC machine, having an armature resistance of 0.1Ω and field resistance of 200Ω , is to be started with a starting resistance to limit the starting current to 120 % of full load current. **Design** the required value of the starting resistance? **What will happen if** the starting resistance is not provided? [7Mark/ a.15.2 and b.14.1 and c.13.4]
- c) **Discuss** what will happen in each of the following cases:
- Field circuit is open, while a DC shunt motor is running.
 - When perform the three phase full-wave controlled rectifier at a firing angle of 120° with resistive load
 - Resistive load of half-wave single-phase rectifier is replaced with inductive load.

[6Mark/ a.15.4, b.14.2 and c.13.4]

Question Three: (20 Mark) [measures the ILOs of a.3, a.15, b.5, b.14, c.5 and c.13]

a) **Explain**, experimentally, how you can obtain DC source from a single phase AC source, (full- wave uncontrolled and controlled rectification). **Which** of them you prefer and **explain** the following terms for each method:

i). Ripple factor ii) Efficiency [8Mark/ a.3.1, a.15.4, b.5.2, c.5.2]

b) **Sketch** the output voltage waveform which can be obtain experimentally (with resistive load) from three phase full-wave controlled rectifier **at $\alpha=60^\circ$** and **explain** with the suitable relation the effect of firing angle in **output voltage**.

[8Mark/ b.5.2 and c.5.2]

c) **How can** you control the speed of DC shunt motor using power electronic circuits studied in laboratory course?

[4Mark/ a.3.1 and c.13.4]

Best wishes

Committee of corrections and Testers

Dr. Amlak Abaza

