



This Exam measures the ILOs [a.1, a.5, b.5, b.14, c.5, and c.13]

Answer the Following Questions:

Question One: (15 Mark) [measures the ILOs of a1, b.5, b.14, and c.13]

- a) **Draw** the connection diagram to perform: [4Mark/ a.1, 1 and c.13.1]
- Load characteristic curve of separately- excited DC generator.
 - Load characteristic curve of self- excited DC shunt generator.
- b) **Show**, experimentally, how to **perform** load test of separately-excited DC generator. [5Mark/ b.14.2 and c.13.2]
Interpret your results.
- c) In the laboratory, the open circuit characteristic of a separately excited DC generator driven at 1000 rpm is measured as follows:-

Field current(A)	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
EMF(V)	30	55	75	90	100	110	115	120

- From your results, **demonstrate** the open circuit characteristic curve at 1500 rpm.
- Is** the generator produce voltage at an exciter current of zero ampere? **Explain** your opinion.
- The machine field resistance is 6 Ω . The machine is connected as a shunt generator and driven at 1500 rpm. An external resistance R_x is added in series in field circuit. Evaluate the operating open circuit voltage of this machine. [6Mark/ b.5.2 and b.14.2]

Question Two: (15 Mark) [measures the ILOs of a1, b.14, and c.5]

- a) **Prepare**, experimentally, the starting test of DC shunt generator. [5Mark/ a.1.1 and c.5.1]
- b) A DC shunt motor is loaded. How can the speed be raised? [4Mark/ c.5.1]
- c) A 200V, 5 kW DC machine has an armature resistance of 0.05 Ω . The machine is operating as a shunt motor. To limit the starting current to the 110% of full load current, a starting resistance is added. In your laboratory:
- Design** the required value of the starting resistance.
 - Select** and **explain** another method to start the motor. [6Mark/ a.1.1 and b.14.1]

Question Three: (15 Mark) [measures the ILOs of a.1, b.5, b.14, and c.5]

- 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 **why**? [8Mark/ a.1,2 b.5.2, c.5.1]
- b) **What** is the effect of :
- Inductance load for the rectifier circuits? Describe and sketch.
 - Freewheeling diode for the rectifier circuits? Describe and sketch.

[7Mark/ b.14.1 and b.5.2]

Question Four: (15 Mark) [measures the ILOs of a.1, b.5, and b.14]

- a) **Sketch** the output voltage waveform which can be obtain experimentally from:
- Three phase full-wave controlled rectifier at $\alpha=30^\circ$
 - Three phase full-wave controlled rectifier $\alpha=120^\circ$. [9Mark/ a.1,2 and b.5.2]
- b) **Explain** the following practical states:
- When perform open circuit characteristic test for self-excited shunt DC generator the terminal voltmeter reads zero voltage.
 - When perform the starting test of DC shunt motor the speed increase with increase the added external field resistance.
 - When perform the three phase full-wave controlled rectifier at a firing angle of 130° the output voltage becomes zero.

[6Mark/ b.14.2]

Best wishes

Committee of corrections and Testers

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