



This Exam measures the ILOs [a.1, a.5, b.5, b.14, 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: (30 Mark) [measures the ILOs of a1.2, , a.5.3, b.5, b.14.1, and c.13.4]

- a) **What** is the difference between the external characteristics of separately-excited DC generator and that of self-excited DC shunt generator? **Explain** an experiment to determine these characteristics. **Sketch** the results. [10Marks]
- b) **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. [10Marks]
- c) **Under what** condition(s), the build-up of open circuit voltage in self-excited DC shunt generator can be obtained? In the laboratory, the open circuit characteristic of a self-excited DC shunt generator driven at 2000 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)	60	110	150	180	200	220	230	240

The machine field resistance is 7 Ω . The machine is driven at 2000 rpm. An external resistance R_x is added in series in field circuit. [10Marks]

- i). **Find** the value of external resistance R_x to obtain terminal voltage of 220V.
- ii). If R_x is equal to 290 Ω , **what** is the value of the machine terminal voltage?

Question Two: (30 Mark) [measures the ILOs of a1.2, a.5.1, b.5., c.13.2, and c.13.4]

- a) **Explain**, experimentally, **how can you** obtain DC source from a single phase AC source, (half-wave uncontrolled and controlled rectification) with R-L load. **Which** one you prefer and **why**? **Sketch** the voltage and current waveform. [15Marks]
- b) **Sketch** the output voltage waveform which can be obtain experimentally (with resistive load) from:
- i) Three phase full-wave controlled rectifier **at $\alpha=90$**
- ii). Three phase full-wave controlled rectifier **$\alpha=120$** . [15Marks]

Best wishes

Committee of corrections and Testers

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