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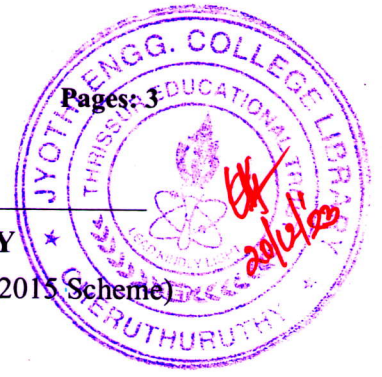
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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S, FE) / S5 (PT) (S, FE) Examination December 2023 (2015 Scheme)



Course Code: EE311

Course Name: ELECTRICAL DRIVES & CONTROL FOR AUTOMATION

Max. Marks: 100

Duration: 3 Hours

Graph sheets shall be provided

PART A

Answer any three full questions, each carries 10 marks.

Marks

- 1 a) Give the classification of the DC generators depending upon their field excitation with neat diagrams. (4)
- b) Explain armature reaction in a DC generator? Write any two methods to compensate it. (6)
- 2 The magnetization characteristics for a 4-pole, 110V, 1000rpm shunt generator is (10)

I_f (A)	0	0.5	1	1.5	2	2.5	3
E_o (V)	5	50	85	102	112	116	120

- Armature is lap-connected with 144 conductors. Field resistance is 45 Ω . Determine
- Voltage the machine will build up at no load.
 - The critical resistance.
 - The speed at which the machine just fails to excite.
 - Residual flux per pole
- 3 a) Draw the power flow diagram of a DC motor. (3)
- b) What is the necessity of starter in dc motor? (4)
- c) What is meant by back emf? Explain its significance. (3)
- 4 a) A 230 V DC series motor has an armature circuit resistance of 0.2 Ω and field resistance of 0.1 Ω . At rated voltage, the motor draws a line current of 40A and runs at a speed of 1000 rpm. Find the speed of the motor for a line current of

20A at 230 V. Assume that the flux at 20A line current is 60% of the flux at 40A line current.

- b) With the help of speed-armature current characteristics, explain why the series motors should not be started without any load. (4)
- c) List out any two applications of DC shunt and series motors. (2)

PART B

Answer any three full questions, each carries 10 marks.

- 5 a) Explain the working of CT and PT with suitable diagrams. (6)
- b) Draw the vector diagram of a single phase transformer with capacitive load. (4)
- 6 a) Derive the condition for maximum efficiency in a single phase transformer. (4)
- b) Draw the approximate equivalent circuit referred to low voltage side of a given 1000/200 V, 50 Hz, 1phase, 5 kVA transformer having the following test results.
O.C test (on L.V. side) :- 200V, 1.2A, 90W
S.C test (on H.V side) :- 50 V, 5A, 110W (6)
- 7 a) Compare slip ring and squirrel cage induction motors. (3)
- b) Draw and explain the torque - slip characteristics of three phase induction motor. (4)
- c) With suitable circuit diagram, explain auto transformer starting method of a three phase induction motor. (3)
- 8 a) Explain the working principle of three phase induction motor with neat diagrams. (6)
- b) A 6 pole, 50 Hz, 3phase induction motor has a rotor resistance of $0.03 \Omega/\text{ph}$ and standstill reactance of $0.20 \Omega/\text{ph}$. Determine (4)
 - i. The speed at which maximum torque is developed.
 - ii. The rotor current frequency

PART C

Answer any four full questions, each carries 10 marks.

- 9 a) Explain any two methods of starting of single phase induction motors with diagrams. (4)
- b) Explain the e.m.f method of determining the voltage regulation of an alternator. (6)
- 10 a) Explain with diagram the working of universal motor. (5)
- b) Explain the V curves of a synchronous motor. (5)

- 11 a) Explain the principle of operation of 1-phase induction motor. (4)
b) Derive the e.m.f equation of an alternator. (6)
- 12 a) Explain the working of multi stack variable reluctance stepper motor with neat figure. (6)
b) Explain the working of a digital controller. (4)
- 13 a) With suitable block diagrams explain the control of stepper motors. (5)
b) Write short notes on axis controller and machine tool controller. (5)
- 14 a) Explain the features and applications of programmable logic controllers. (6)
b) Draw and explain the torque-speed characteristics of stepper motor. (4)
