U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Electrical & Electronics Engineering **Duration: 3 hrs.**
Course Code: 19EE5PCMC2 **Max Marks: 100**
Course: ELECTRICAL MACHINES - II

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Draw connection diagram of DC shunt and DC series generators. Give its voltage and current equations. **04**

b) Describe armature reaction in DC generators. Bring out the differences between effect of armature reaction in DC motors in comparison with DC generators. **08**

c) A 240 V, D C shunt motor takes an armature current of 15 A when running at 800 rpm against full load torque. The armature resistance is 0.6 ohm. What resistance must be inserted with the armature in series to reduce the speed to 400 rpm at the same torque? What will be the speed if load torque is halved with this resistance in the circuit? Assume flux to remain constant throughout. **08**

OR

2 a) Draw the connection diagram of DC shunt and DC series motors. Give its voltage and current equations. **04**

b) Describe the process of current reversal through a coil undergoing commutation in a DC generator. **08**

c) A DC shunt motor drives a centrifugal pump whose torque varies as the square of the speed. The motor is fed from a 200 V supply and takes 50 A when running at 1000 rpm. What resistance must be inserted in the armature circuit in order to reduce the speed to 800 rpm? Armature resistance of the motor is 0.1 ohm and field resistance is 100 ohm. **08**

UNIT - II

3 a) Compare direct and indirect methods of testing Electrical Machines **04**

b) Describe field test on DC series motor **08**

c) A 1000 rpm DC shunt machine on retardation test gave the following test data: **08**
A fall in speed of 1030 rpm to 970 rpm took
i) 15 seconds with field excited
ii) 9 seconds with armature supplying a load of 10A at 219 Volt with field excitation.
Find the moment of inertia of the rotating mass in kg-m^2
and Stray losses of the DC machine on test.

UNIT - III

4 a) Deduce the expressions for coil pitch factor, winding distribution factor and induced EMF of a synchronous generator. **10**

b) Justify the statement "Synchronous motor is not a self-starting motor" with the help of neat diagrams. Describe any one method of starting synchronous motor. **10**

UNIT - IV

5 a) List the conditions to be fulfilled to connect a three-phase alternator to bus bars. **10**
Explain dark lamp method of synchronizing a three-phase alternator with the bus bars with the help of a neat circuit diagram. State the disadvantages of dark lamp method.

b) For a synchronous generator a given field current produces an open circuit EMF of 1500 V per phase and a short circuit current of 250A. The armature resistance is 2.0 ohm per phase. Find the EMF per phase when a load current of 250 A at 6.6 kV per phase at a lagging power factor of 0.8 is switched off. **10**

OR

6 a) Describe slip test on salient pole alternator in detail. Show how do you find Xd and Xq from slip test readings. **10**

b) Two synchronous generators are supplying a common load of 2.5 MW at 0.8 power factor lagging. **10**
Generator 1: No load frequency 51.5 Hz and regulation of 1 MW/Hz
Generator 2: No Load frequency of 51 Hz and regulation of 1 MW/Hz.
Compute:
i) At what frequency are the generators supplying this load
ii) What is the power supplied by each generator?
iii) Frequency of operation and load shared when an additional load of 1 MW at same power factor is attached to the system.

UNIT - V

7 a) For a synchronous machine operating in motoring mode deduce the expression for mechanical power output per phase with and without armature resistance **08**

b) Discuss about the effect of change in excitation with constant load of a synchronous machine in i) generating mode and ii) motoring mode with the help of relevant diagrams **12**

******