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# P.E.S. College of Engineering, Mandya - 571 401
### *(An Autonomous Institution affiliated to VTU, Belagavi)*
### Fifth Semester, B.E., - Electrical and Electronics Engineering
### Semester End Examination; Dec - 2017/Jan - 2018
### Electrical Machines - II

*Time: 3 hrs*                                                            *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

## UNIT - I

| | | |
|---|---|---|
| 1 a. | Explain how to classify generators. Draw a neat circuit of long shunt compound generator and explain briefly. | 7 |
| b. | Write explanatory note on losses in DC generator. | 7 |
| c. | What are interpoles? Explain the uses of interpoles in DC generator. | 6 |
| 2 a. | Explain the process of commutation. | 6 |
| b. | Derive an expression for the EMF induced in DC generator. | 6 |
| c. | The brushes of a 4-pole, 48 kW, 400 V wave connected DC generator are shifted from the geometrical neutral axis by 4 mechanical degrees. If the generator has 720 conductors and delivers full load current. Find; <br> i) Demagnetising Ampere-turns/pole    ii) Cross magnetizing Ampere-turns/pole. | 8 |

## UNIT - II

| | | |
|---|---|---|
| 3 a. | Explain the significance of Back EMF. | 5 |
| b. | Explain with a neat sketch the working of three-point starter. | 8 |
| c. | A 4-pole DC shunt motor takes 22 A from 220 V supply. The armature and shunt field resistances are 0.5 Ω and 100 Ω respectively. The armature is lap connected with 300 conductors. If the flux/pole are 20m wb, calculate the speed and developed torque. | 7 |
| 4 a. | Derive an expression for the torque of DC motor. | 6 |
| b. | Explain briefly the various characteristic curves of DC shunt motor. | 6 |
| c. | A DC shunt motor runs at 1000 rpm on 200 V supply. Its armature resistance is 0.8 Ω and the current taken is 40 A, in addition to field current. What resistance must be connected in series with the armature to reduce the speed to 600 rpm, the current in the armature remaining same? Neglect armature reaction. | 8 |

## UNIT - III

| | | |
|---|---|---|
| 5 a. | List the advantages and disadvantages of permanent magnet motor. | 8 |
| b. | Explain the swinburn's test to determine efficiency as generator and as motor. | 12 |
| 6 a. | Write brief explanatory note on stepper motor. | 5 |
| b. | With a neat diagram, explain the field's test on DC series motor. | 8 |

c.   The Hopkinson's test on two similar DC shunt machines gave for full load the following results:

Line voltage: 200 V, Line current excluding field current: 10 A, motor's armature current: 70 A, motor field current: 1 A, generator field current : 1.2 A, Determine the efficiency of each machine if $R_a$ of each machine $= 0.2\ \Omega$     7

## UNIT - IV

7 a.   Derive an expression for the EMF induced in an Alternator.     10

b.   A 3-$\phi$, 16-pole, star connected alternator has 192 slots, with 8 conductors/ slot and the conductors of each phase are connected in series. The coil span is 150 electrical degrees. Determine the phase and the line EMF's, if the machine runs at 375rpm and the flux/ pole is $6.4 \times 10^{-2}$ wb sinusoilly distributed.     10

8 a.   Distinguish clearly between salient pole rotor and cylindrical rotor of synchronous generator.     6

b.   Define regulation of an Alternator. Explain  ZPF method of determining Voltage regulation.     8

c.   A 100 kVA, 3000 V, 50 Hz, 3-phase star connected alternator has effective  armature resistance of 0.2 $\Omega$. A field current of 40A produces a short circuit current of 200 A and an open circuit emf of 1040 V (Line Value) Calculate the full load percentage Regulation of a pf of 0.8 lag.     6

## UNIT - V

9 a.   Describe the method of synchronizing a 3-phase synchronising machine to the infinite busbars by Dark Lamp method with the relevant circuit diagram.     8

b.   Explain V and inverted V curves.     6

c.   Write explanatory note on Hunting in Synchronous machine.     6

10 a.   Explain slip test for the determination of direct axis and quadrature axis reactances.     10

b.   With Phasor diagram, explain the effect of operation of constant load with variable excitation of a synchronous motor.     10

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