



# NATIONAL INSTITUTE OF TECHNOLOGY, ROURKELA-8

**B.Tech. Mid Semester (Spring) Examination, 2010-11**

**SUBJECT: Electrical Engineering**

**SUBJECT CODE: EE-202**

**Duration of Examination: 2 hours**

**FULL MARKS: 60**

*Figures at the right hand margin indicate marks  
All parts of a question should be answered at one place*

**Answer any six questions**

Q1. Describe with the help of figures and plots the different methods of speed control of DC shunt motor. (10)

Q2. A 250 V DC shunt motor on no load runs at 1000 rpm and takes 5 Amp. The total armature and the shunt field resistances are 0.2 ohms and 250 ohms respectively. Calculate the speed when loaded and taking a current of 50 Amp, if the armature reaction weakens the field by 3%. (10)

Q3. a) Explain with the help of equations and plots, the Speed vs. Armature current, Torque vs. Armature current and Speed vs. Torque characteristics of DC series motor. (06)

b) Draw the construction of DC machine with neat sketch. (04)

Q4. A 240V, 4 pole DC shunt motor running at 1000 rpm gives 15 hp with an armature current of 50 A and field current of 10 Amp. The armature winding is wave connected and has 540 conductors. Its resistance is 0.1 ohms and drop at each brush is 1 V. Find i) the total torque ii) Rotational losses iii) Armature Copper loss iv) Shunt field copper loss v) efficiency of DC motor. (10)

Q5. The following data were obtained from testing a 48 KVA, 4800/240V, 50 Hz transformer. (04+04+02)

O.C test (from LV side):	240 V, 2 A, 120 W
S.C test (from HV side):	150 V, 10 A, 600 W

- (i) Draw the equivalent circuit referred to the HV side and insert all the parameter values.  
(ii) At what KVA the transformer should be operated for *maximum efficiency*? Also calculate the value of maximum efficiency for 0.8 lagging factor load.  
(iii) Calculate the load current corresponding to maximum efficiency.

Q6. a) Voltage regulation of a transformer varies with power factor. Validate this statement through suitable derivations. At what power factor will the regulation be i) Maximum ii) Zero. (08)

b) Compare Core type and Shell type transformers. (02)



Q7. The daily variation of load on a 100 KVA transformer as follows

8.00 A.M to 1.00 P.M	65 KW under $\frac{3}{4}$ of full load @ 0.8 p.f lag
1.00 P.M to 6.00 P.M	80 KW under full load @ unity p.f
6.00 P.M to 1.00 P.M	30 KW under $\frac{1}{2}$ of full load @ 0.6 p.f lag
1.00 A.M to 8.00 A.M	No load

The transformer has no-load core loss of 370 watts and a full load copper loss of 1200 watts. Determine the all day efficiency of the transformer (10)

Q8. A single-phase transformer is designed to operate at 240/120 V, 50 Hz. Calculate the no-load secondary voltage and its frequency if the h.v. side of the transformer is connected to (a) 240 V, 40 Hz. (b) 120 V, 50 Hz. (c) 120 V, 40 Hz. (d) 480 V, 50 Hz. (e) 240 V DC. (10)