# B.Tech. IN ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

June, 2012

## BIEE-008 : ELECTRO MECHANICAL ENERGY CONVERSION - I

*Time : 3 hours*  *Maximum Marks : 70*

*Note :*  *Attempt any **Seven** questions out of **ten** questions.*
   *Each question carries **10** marks.*
   *Answer the questions in **English** language.*

1. (a) Discuss in brief about principle of energy conversion. **5x2=10**

   (b) Explain the term "co-energy" in electromechanical energy conversion and show that co-energy is given by :

   $W_f = \dfrac{1}{2} PF^2$ where P = permeance of the

   magnetic circuit and F = mmf in coil of magnetic circuits.

2. (a) What is meant by commutation process in dc machines ? How is current commutation is achieved in dc machines ? **5x2=10**

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(b) Derive the emf equation for a dc machine having P number of poles and lap wounded.

3. (a) A dc series motor runs at 1000 rpm and takes 25A from 250V mains. The armature current is then reduced to 15A by inserting a series resistance. Find the new speed and the value of the resistance inserted if the load torque varies as square of the speed and the field flux is reduced by 15% for above change in the armature current. Assume the combined resistance of the armature and series field to be 1.0 $\Omega$. **5x2=10**

(b) What is the difference a starter and a controller as used in dc motors ? What may happen to a dc shunt motor connected to a 3 point starter if the field excitation is kept minimum at the time of starting ?

4. (a) Describe the constant-torque drive and constant power drive methods for the speed control of dc motors. **5x2=10**

(b) Explain the working principle of a 3 point starter of a dc shunt motor. What modifications is made in a 4 point starter ?

5. (a) Following are the test figures for the 4KVA, 200V/400V, 50Hz single phase transformer:
**5x2=10**

OC Test    :    200 V,  0.8 A, 70 W

SC Test    :    17.5 V, 9A,  50W

Calculate  (i) full load efficiency at upf.

(ii) at half full load at 0.8 pf.

(b)   Differentiate between core type and shell type transformers.

6.   (a)   List the merits and demerits of auto transformer over two winding transformer. Also mention the applications of auto transformer.                                5x2=10

(b)   Draw the physical connection and phasor diagrams of (i) DZO and (ii) Yd 11.

7.   (a)   Why transformers are placed in oil filled tanks ?                                   5x2=10

(b)   Sketch the external characteristic of a shunt generator and explain the reason for its special nature :

Part of it is two valued.

8.   (a)   Draw the scott connection of transformers and mark the terminals and turn ratio.  5x2=10

(b)   What is inrush phenomenon in transformer ? Discuss qualitatively this phenomenon if single phase transformer is switched on at the instant applied voltage is maximum positive.

9.  (a)  State the necessary conditions for satisfactory operation of two transformers in parallel.                              **5x2=10**

    (b)  Why is electric braking of electric motors superior to mechanical braking ? How is dynamic braking of dc shunt motor done ?

10.  Write short notes on *any two* :              **5x2=10**

    (a)  Starter step calculation of a dc shunt motor.

    (b)  Ward leonard method of speed control.

    (c)  Power transformer and Distribution transformer.

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