B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

00316   **Term-End Examination**

June, 2015

BIEE-004 : ELECTRICAL MACHINES-I

Time : 3 hours   *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1.   Write short notes on any **two** of the following :

$2 \times 7 = 14$

   (a)   Heat run test of a transformer

   (b)   EMF generation in dc machines

   (c)   Speed-torque characteristic of dc shunt motor

2.   What is armature reaction in a dc machine ? Explain the different methods used to reduce the effect of armature reaction in detail.   *14*

3.   (a)   Discuss the voltage build-up process of a self-excited shunt generator.   *7*

(b) A 2-pole dc shunt generator charges a 100 V battery of negligible internal resistance. The armature of the machine is made up of 1,000 conductors, each of 2 milli-ohm resistance. The charging currents are found to be 10 A and 20 A for generator speeds of 1055 and 1105 rpm, respectively. Determine the shunt field current of the generator.   7

4. (a) Using schematic circuit diagram and speed-torque characteristics, discuss the method of shunt motor speed control by varying the armature circuit resistance.   7

   (b) A 250 V dc shunt motor has an armature resistance of 0·5 Ω and a field resistance of 250 Ω. When driving a constant torque load at 600 rpm, the motor draws 21 A. What will be the new speed of the motor, if an additional 250 Ω resistance is inserted in the field circuit ?   7

5. (a) Explain the various components of transformer losses.   7

   (b) The ohmic, hysteresis and eddy current losses in a transformer at 50 Hz are 1·6%, 0·9% and 0·6%, respectively. For Steinmetz's coefficient of 1·6, determine the hysteresis and eddy current losses for same system voltage and current at 60 Hz of supply frequency.   7

6. (a) With the help of a transformer phasor diagram for leading p.f. load, explain its working. Restrict your discussion to leading p.f. condition. 7

(b) A 2200/220V, 50 Hz, 1-ϕ transformer has exciting current of 0·6 A and a core loss of 361 watts, when its h.v. side is energized at rated voltage. Determine the core loss and magnetising component of exciting current. 7

7. (a) Compare an autotransformer with a two-winding transformer. 7

(b) State the conditions essential for the successful parallel operation of three-phase transformers. 7

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