Student Exam No: _____

# GANPAT UNIVERSITY

## B.Tech Sem. III[rd] Biomedical & Instrumentation

## Regular Exam November / December-2012

## 2BM302:Medical System Actuators & Electrical Machines

**Time: 3 Hours** **Total Marks-70**

**Instructions:-**

1. All the questions are compulsory.
2. Answer of each section must be written in separate answer books.
3. Figure to the right indicate marks.
4. Assume data, if needed.
5. Conventional terms / notations are used.

**Section – I**

**Que.1** [12]

a). Define actuators and also explain the types and application of Actuators .

b). Explain the construction of DC machine with diagram.

**OR**

**Que.1.** [12]

a). Define Dc Motor and Generator with principle operation.

b). Derive the equation of armature torque whose quantities are constant.

**Que.2.** [11]

a). Explain the significance of Back EMF.

b). Derive the equation of maximum efficiency in Dc Motor.

**OR**

**Que.2** [11]

a). Explain different types of Dc machine.

b). Explain Dc generator characteristics with diagram.

**Que.3.** [12]

a). Derive the equation of EMF generated in DC Generator.

b). Explain Iron losses in Dc machine.

c). A 6 pole generator armature has 1000 conductors and is wave wound. if the flux per pole is 20milliweber and the speed is 500 rpm. calculate the EMF generated. if the above machine is self excited and the armature and the field resistance are 0.5 ohm and 250 ohm. calculate the output current when the armature current is 40A.

## Section – II

**Que.4.** **[12]**

a). Derive EMF equation of a transformer .Also prove that
$I_2/I_1 = V_1/V_2 = N_1/N_2 = 1/K$

b). Obtain the equivalent circuits of a 200/400 v,50 Hz, 1 phase transformer from the following list data
Open circuit test : 200V,0.7A,70W - on L.V. side
Short circuit test: 15V,10A,85W-on H.V. side
Calculate secondary voltage when delivering 5 KW of 0.8 p.f lagging, the primary voltage being 200V.

**OR**

**Que.4.** **[12]**

a). With Diagram explain the equivalent circuits of transformer and derive necessary equation.

b). A 1 phase transformer 400 primary & 1000 secondary turns. The net cross-sectional area of the core is $60cm^2$.If the primary winding be connected to a 50 Hz supply at 520V, calculate
i) the peak value of flux density in core.
ii) the voltage induced in the secondary winding.

c). Why transformer rating in KVA ?

**Que.5.** **[11]**

a). What is induction motor ? Types of Induction Motor and also Explain the merits & demerits of induction motor.

b). Draw and Explain construction of three phase induction motor.

**OR**

**Que.5.** **[11]**

a). How squirrel cage motor and wound rotor motor starting is done ?

b). A 6 pole 3 phase 50 Hz induction motor has full load speed 3%.Calculate the full load speed and frequency of the rotor current.

**Que.6.** **[12]**

a). Define Relay with its component and also explain its application.

b). Explain solenoid valve with principle, construction and its types .

c). Define Hysterist losses.

**END OF PAPER**