M 18986

Reg. No. : .....

Name : .....

VIII Semester B.Tech. (Reg./Sup./Imp.) including Part-Time Degree Examination, April 2011
(2007 Admn.)
PT2K6/2K6 EE 801 : INSTRUMENTATION SYSTEMS
Electrical and Electronics Engineering

Time : 3 Hours Max. Marks : 100

1. a) Define any three required characteristics of a transducer and explain. 5
   b) Explain the working of a dew point meter for moisture measurement with figure. 5
   c) Draw the circuit of a differential amplifier and derive the equation for output. 5
   d) Write a note on frequency modulation with necessary equation and figure. 5
   e) Explain the function of a LCD with figure. 5
   f) What is a Histogram ? Explain with example. 5
   g) Define the following terms :
      i) Speed of response ii) Measuring lag
      iii) Fidelity iv) Dynamic error. (1+2+1+1)
   h) Discuss any three standard test signals used in time domain analysis. 5

2. a) Explain the working principle of a linear variable differential transformer and also list out its advantages and disadvantages. 15

   OR

   b) i) Explain the theory of strain Gauges and derive the equation for Gauge factor. 9
      ii) Write a note on semi conductor strain Gauges. 6

3. a) Derive the expression for output voltage of a passive high pass filter. Derive the cutoff frequency equations and draw the frequency response curve. Explain the application of a R.C. high pass filter for the measurement of infra red radiant energy. 15

   OR

   b) Draw the circuit of an input modulator and balanced demodulator and explain its working with necessary output waveforms. 15

P.T.O.

4. a) List the basic components of a magnetic tape recorder and explain its working. Also discuss about the advantages of magnetic tape recorders. **15**

OR

b) Classify errors and explain about the types in detail. **15**

5. a) Explain how the effects of modifying and interfering inputs is minimized/ eliminated in measurement systems. Cite suitable examples. **15**

OR

b) i) Derive the differential equation describing the dynamics of a liquid level system with respect to laminar and turbulent flow. **10**

ii) Define transfer function and summarize its properties. **5**

M 18987

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VIII Semester B.Tech. (Reg./Supple./Imp.) including Part Time Degree Examination, April 2011
ELECTRICAL AND ELECTRONICS ENGINEERING
PT 2K6/2K6 EE 802 : Industrial Electric Drives
(2007 Admn.)

Time: 3 Hours Max. Marks: 100

***Instruction** : Answer **all** questions from Q I.*

I. 1) Explain the current limit control with a block diagram.

2) Explain different components of load torques.

3) A 200V, 10.5A, 2000 rpm shunt motor has the armature and field resistances of 0.5 and 400 Ω respectively. It drives a load whose torque is constant at rated motor torque. Calculate the motor speed if the source Vg. drops to 175V.

4) Explain transient analysis of separately excited motor with armature control.

5) Explain control by ac voltage controllers and soft start in an IM.

6) Explain self excited braking using capacitors.

7) Explain the operation of variable frequency control of multiple synchronous motors with a neat diagram.

8) Explain the operation of self controlled synchronous motor drive employing a cycloconverter. **(8×5=40)**

II. a) Explain load equalization. **15**

OR

b) Explain speed torque conventions and multiquadrant operation.

III. A) A 220 V, 970 rpm, 100A dc separately excited motor has an armature resistance of 0.05 Ω. It is braked by plugging from an initial speed of 1000 rpm. Calculate : **8**

a) Resistance to be placed in armature ckt to limit braking current to twice the full load value.

b) Braking toque and

c) Torque when the speed has fallen to zero.

P.T.O.

B) A 2-pole separately excited dc motor has the ratings of 220V, 100A and 750 rpm. Resistance of the armature is $0.1\,\Omega$. The motor has two field coils which are normally connected in parallel. It is used to drive a load whose torque is expressed as $T_L = 500 - 0.3N$, N-m where N is the motor speed in rpm. Speeds below and above rated are obtained by armature Vg. control and by connecting the two field windings in series respectively.

i) Calculate the motor armature current and speed when the armature Vg. is reduced to 110V.

ii) Calculate the motor speed and current when field coils are connected in series. **7**

OR

Explain transient analysis of starting of separately excited motor with armature control. **15**

IV. Explain the working of VSI induction motor drives. **15**

OR

Explain the working of current source inverter control with a neat schematic.

V. Explain the working of self controlled synchronous motor drive employing load commutated thyristor inverter. **15**

OR

A synchronous motor is controlled by a load commutated inverter, which in turn is fed from a line commutated converter. Source voltage is 6.6kV, 50 Hz. Load commutated inverter operates at a constant firing angle α_l of 140° and when rectifying $\alpha_l = 0^\circ$ dc link inductor resistance $R_d = 0.1\,\Omega$. Drive operates in self-control mode with a constant $\left(V/f\right)$ ratio. Motor has the details :

8 MW, 3ϕ, 6.6kV, 6 pole, 50 Hz, u.p.f. star connected, $X_s = 2.8\,\Omega$, $R_s = 0$.
Determine source side converter firing angles for the following :

i) Motor operation at the rated current and 500 rpm. What will be the power developed by motor ?

ii) Regenerative braking operation at 500 rpm and rated motor current. Also calculate power supplied to the source.

M 18988

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VIII Semester B.Tech. (Reg./Sup./Imp.) including Part Time Degree Examination, April 2011

(2007 Admin.)

ELECTRICAL AND ELECTRONICS ENGINEERING

PT 2K6/2K6 EE 803 : Electrical Machine Design

Time: 3 Hours Max. Weightage : 100

Instructions : *1) **Any** missing data may be **assumed** suitably.*
*2) Answer **all** questions from Q. **I.***

I. 1) Deduce the relation of torque developed by the armature in De machine.

2) Explain the term reluctance of air gap with slotted armatures.

3) Explain the term optimum design in single phase transformers.

4) Explain the radial forces developed in a transformer.

5) Explain single layer winding in AC machines.

6) Explain the various types enclosures that is used in rotating electrical machines.

7) What are the two major factors which influence the power factor of an IM ?

8) Deduce a relation between D and α for best power factor in a 3ϕ IM. **(8×5=40)**

II. A) A 5 kW, 250V, 4 pole, 1500 rpm, shunt generator is designed to have square pole face. The loadings are :

Average flux density in the gap = 0.42wb/m^2 and ampere conductors/ metre = 15,000. Find the main dimensions of the m/c. Assume full load $\eta = 0.87$ and ratio of pole are to pole pitch = 0.66. **8**

B) Calculate the diameter and length of armature for a 7.5 kW, 4 pole, 1000 rpm, 22V shunt motor. Given full load $\eta = 0.83$, max gap flux density = 0.9wb/m^2, specific electric loading = 30,000 amp conductors/ metre. field form factor = 0.7 Assume that the max η occurs at fL and the field current is 2.5% of rated current. The pole face is square. **7**

OR

P.T.O.

II. a) Explain the different factors should be considered when selecting the number of armature slots. **6**

b) The armature core of a 4 pole d.c. machine has 31 slots, each designed to accommodate 4 coil sides of a simplex wave winding. The winding has a total of 496 conductors. Find the total number of coils, turns/coil, commutator segments and back, front and total pitches. **9**

III. a) Explain different methods of cooling of transformers. **7**

b) Explain the output equation-Volt Perturn. **8**

OR

a) Explain the operation of Bushings of a transformer with a neat fig.

b) Explain the concept of tap changing and tappings in transformers. **15**

IV. A 1500 rpm, 50Hz star connected salient pole, 3 phase alternator has a single-layer stator winding with 300 turns per phase and a spread of 60°. If there are 800 exciting turns on each pole, calculate the change in the field current necessary to maintain the same terminal voltage when the output of the machine is varied from zero to 50A at zero P.f. assuming stator winding to be uniformly distributed. Take the field mmf to be a rectangle extending over polar are and the ratiopole : pole pitch = 2/3. **15**

OR

A pole, 50Hz, 3ϕ alternator has a single layer winding with 5 slots/phase and 1 conductor per slot. The fundamental component of flux per pole is 1.8 Wb. The air gap flux contains a 10 percent third harmonic, and a tooth ripple with a minimum amplitude of 5%. Calculate the emf of each phase.

V. A 15 kW, 400V, 3 phase, 50Hz, 6 pole IM has a diameter of 0.3 m, and the length of core 0.12m. The no of stator slots is 72 with 20 conductors/ slot. The stator is delta connected. Calculate the value of magnetizing current/phase if the length of air gap is 0.55 m. The gap contraction factor is 1.2. Assume the mmf required for the iron parts to be 35% of the air gap mmf. Coil span = 11 slots. **15**

OR

Calculate the equivalent resistance of rotor per phase in terms of stator, current in each bar and end ring and total I^2R loss for the following :

4 pole, 3ϕ, 50Hz, 400V cage motor has 48 slots in stator with 35 conductors/slots. Each conductor carries a current of 10A. The rotor has 57 slots, each slot has a bar of 0.12m length and 50mm^2 area. The mean diameter of each ring is 0.2 m and area is 175 mm^2. Resistivity is 0.02Ω/m and mm^2 and the P.f. is 0.8. The stator winding uses full pitched coils with a phase spread of 60°. **15**

M 19047

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VIII Semester B.Tech. (Reg./Sup./Imp.) including Part Time – Degree Examination, April 2011
(2007 Admn.)
ELECTRICAL AND ELECTRONICS
PT 2K6/2K6 EE 804 : Energy Technology

Time: 3 Hours Max. Marks: 100

I. 1) Explain the terms energy security, per capita consumption and energy intensity. 5

2) Explain energy conservation and energy management. 5

3) Discuss the different ways of improving Pf. 5

4) Explain the soft starters used with motors. 5

5) Discuss the main features of important semiconductor materials used with SPV. 5

6) Briefly explain the basic components of a WECS. 5

7) Explain the different ways used for the excitation of IG. 5

8) Explain the simple payback period methods of financial analysis. 5

II. 9) A) An engineering industry has lighting load of 40 kVA. The incoming supply voltage is 415 V during day time and 440 V during night time. Lighting load during day time = 20 kVA. Lighting load during night time = 40 kVA. Power factor in lighting feeder = 0.7. Energy cost = Rs. 5/kW, energy manager has intake a 50 kVA lighting transformer. The lighting voltage is set to 200 V always. (i) Find out the pay back period if investment for transformer is Rs. 25,000 (ii) What is the % saving (energy). 10

B) List out the energy conservation opportunities in motor. 5

OR

10) A) List out the duties and responsibilities of energy auditor. 5

B) Explain the good practices in lighting and six step methodology of lighting system energy efficiency study. 10

P.T.O.

III. 11) With the help of relevant diagrams explain maximum demand controller and automatic power factor controller. **15**

OR

12) Explain in detail the different energy efficiency technologies used with lighting system and also explain the variable speed drives used for improving energy efficiency. **15**

IV. 13) A) The instantaneous carrier concentration in a n-type semiconductor at two points separated by 100 μm from each other are 1×10^{17} # /cm^3 and 1×10^{15} # /cm^3. If the diffusion coefficient of the electron in the semiconductor is 30 cm^2/s find out the diffusion current density in semiconductor. **7**

B) Discuss the merits and demerits of Savonius and Darricus rotors used with vertical axis wind mill. **8**

OR

14) A) Calculate the declination angle, local apparent time for the collector location in Bombay (19.12 N, 72.51 E) and it tilted at an angle of 30° with horizontal and is pointing due south on October 1. **5**

B) A heterojunction solar cell of active area 6 cm^2 gave the following results ; V_{OC} = 400 mV, S_{CC} = 200 mA under insulation of 0.8 Sun. What is the energy efficiency of the device ? Take fire factor 80%. **5**

C) Briefly explain different scheme used for power generation with wind mill. **5**

V. 15) A) Calculate the IRR for a RES based project that will cost Rs. 3,00,000 will last for 5 years and will result in fuel savings of 1,20,000. If the company got the loan for investment @ 20% interest, decide about the feasibility of project. **10**

B) Explain the equivalent circuit of DFIG. **5**

OR

16) A) Explain NPV, IRR methods of financial analysis. **6**

B) Compare different generators used with RES based power generation. **9**

M 18989

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VIII Semester B.Tech. (Reg./Sup./Imp.)Including Part Time – Degree Examination, April 2011

(2007 Admn.)

ELECTRICAL AND ELECTRONICS ENGINEERING

PT2K6/2K6 EE 805 (B) – Special Machines and Linear Machines

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** questions from Q. I.*

I. 1. Explain the symmetrical components applied to two-phase servomotor. **(5×8=40)**

2. Draw the two-part equivalent circuit of the two phase servomotor with unbalanced applied voltages.

3. Explain the construction of Hybrid stepping motor.

4. Explain the operation of single track VR step motors.

5. What are the some distinctive differences between switched reluctance and reluctance motors ?

6. Explain the control of switched reluctance motor for traction type load.

7. Explain the working of LIM drive for electric traction.

8. Explain how to develop a double sided LIM from rotary type IM.

II. Explain the working of damped AC servomotors and why damping is required ? **15**

OR

A 5 W, 60 Hz, 120 V, 2 pole 2 phase servomotor has the following parameters

$r_1 = 285\Omega \qquad r'_2 = 850\Omega$

$x_1 = 60\Omega \qquad x'_2 = 60\Omega$

$x\phi = 995\Omega$.

P.T.O.

When it is operating at a slip of 0.6, determine ?

a) The resultant torque in synchronous watts.

b) The stator phase currents.

Assume the servomotor operates with the following unbalanced two-phase voltage.

$\overline{V}a = 120\angle 0^\circ$ and $\overline{V}b = 75\angle -60^\circ$.

III. Explain the working of closed loop control of step motor. **15**

OR

Explain the construction and working principle of single phase stepping motor.

IV. Explain some design aspects of stator and rotor pole arcs in SR motor. **15**

OR

Explain the operation of power converter for SR motor.

V. Derive the solution for current distribution in the rotor. **15**

OR

Explain some laws of electro magnetism to LIM.