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10EE71

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define a primitive network. Give the representation of primitive network in impedance and admittance form. Obtain the performance equations in both the cases. **(06 Marks)**

b. For the power system shown in Fig. Q1(b). Draw the oriented graph and obtain the following incidence matrices.

i) Element – node incidence matrix $\hat{A}$
ii) Bus incidence matrix A
iii) Branch - path incidence matrix K
iv) Basic cutest incidence matrix B
v) Augmented cutest incidence matrix $\hat{B}$
vi)Basic loop incidence matrix C
vii)Augmented loop incidence matrix $\hat{C}$.

Choose bus ① as reference. Take link as elements 4 and 5. **(14 Marks)**

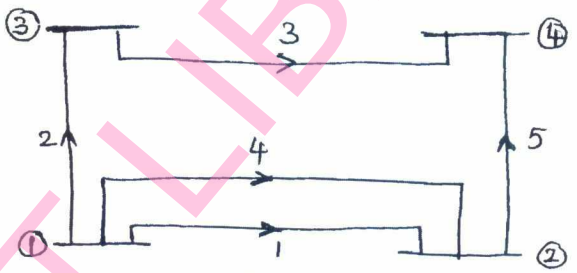

Fig. Q1(b)

2 a. Derive an expression for formation of Bus admittance matrix Y_{BUS} by singular transformation. **(05 Marks)**

b. Derive the generalized algorithm for finding the elements of Bus impedance matrix Z_{BUS} when a link is added to the partial network. **(08 Marks)**

c. For the power system shown in Fig. Q2(c) with Bus 1 as reference and line data impedances in p.u as shown. Compute Z_{BUS} using building algorithm. Add the elements in the sequence 1 – 2, 2 – 3 and 1 – 3. **(07 Marks)**

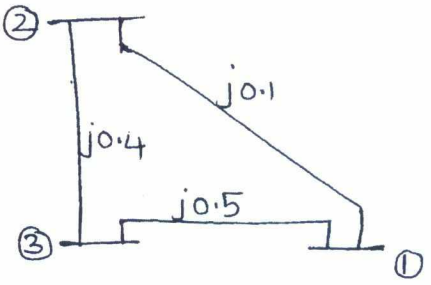

Fig.Q2(c)

3 a. What is load flow problem? Explain in detail the types of buses in a power system. Discuss the significance of slack bus in load flow studies. **(10 Marks)**

b. Fig. Q3(b) shows a three bus power system using G – S method, determine the bus voltages at the end of first iteration. The values shown are line impedances in p.u Bus data are given in Table Q3(b). **(10 Marks)**

Bus	Generation		Load		Voltage	Bus type
	$P_{G(pu)}$	$Q_{G(pu)}$	$P_{D(pu)}$	$Q_{D(pu)}$		
1	–	–	–	–	$1.05\angle 0°$	Slack bus
2	3	–	–	–	1.0	PV bus
3	–	–	4	2	–	PQ bus

Table Q3(b)

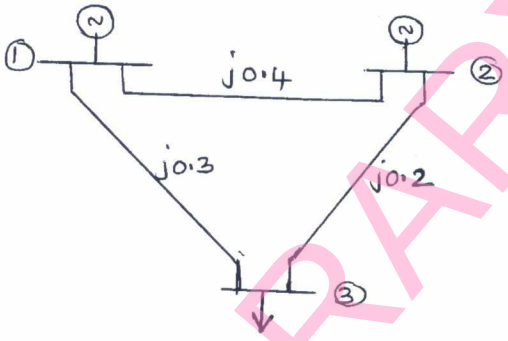

Fig.Q3(b)

4 a. Explain the algorithmic procedure for load flow analysis using Newton – Raphson's method in polar co-ordinates. And compare N – R and G – S method for load flow analysis. **(10 Marks)**

b. What are the assumptions made in fast decoupled load flow method? Explain the algorithm through a flow chart. **(10 Marks)**

PART – B

5 a. What is penalty factor? Derive an expression for optimal economic dispatch including transmission losses. **(10 Marks)**

b. A two bus system is shown in Fig. Q5(b). If 100 MW is transmitted from plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by load when the system λ is Rs. 25/ Mwhr. The incremental fuel costs of the two plants are given below :

$$\frac{dc_1}{dP_{G_1}} = 0.02\ P_{G_1} + 16\ Rs/Mwh$$

$$\frac{dc_2}{dP_{G_2}} = 0.04\ P_{G_2} + 20\ Rs/Mwh.$$ **(10 Marks)**

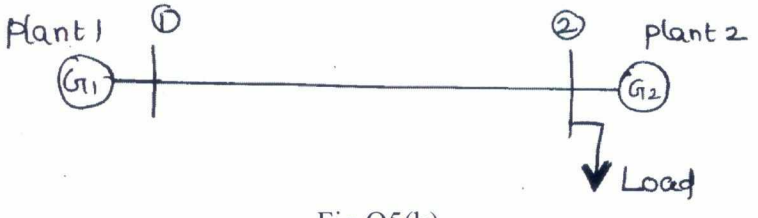

Fig.Q5(b)

6 a. Explain the problem formulation and solution procedure of optimal scheduling for hydro – thermal plants. **(10 Marks)**

b. Compute the loss coefficients for the network shown in Fig. Q6(b), using the given data :

$I_a = 1.0 - j\,0.15$ pu $\quad Z_a = 0.02 - j\,0.15$ pu

$I_b = 0.5 - j\,0.1$ pu $\quad Z_b = 0.03 - j\,0.15$ pu

$I_c = 0.2 - j\,0.05$ pu $\quad Z_c = 0.02 - j\,0.25$ pu. **(10 Marks)**

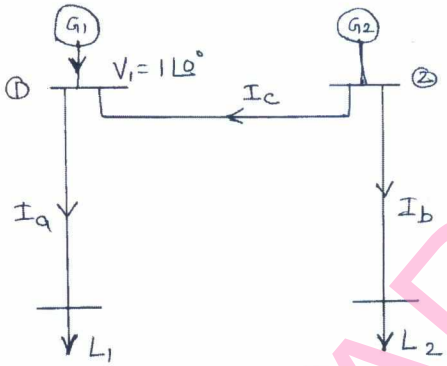

Fig.Q6(b)

7 a. Explain with necessary equations the solution of swing equation by point by point method. **(10 Marks)**

b. Explain the modified Euler's method used in solution of swing equation under transient stability studies. **(10 Marks)**

8 a. Explain Runge – Kutta method used in solution of swing equation for transient stability analysis. **(10 Marks)**

b. Explain Milne predictor corrector method for solution of swing equation. **(10 Marks)**

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10EE72

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Electrical Power Utilization

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With a neat sketch, explain the construction, principle of operation and application of Ajax Wyatt furnace. **(08 Marks)**

b. A three phase arc furnace is used to melt 4.3 tonnes of steel in one hour. Determine the average kW and kVA input to the furnace, arc voltage, arc resistance and power factor of the current drawn from the supply.
Specific heat of steel = 444 J/kg/°C Latent heat of steel = 37.25 kJ/kg
M. P. of steel = 1370°C Initial temperature of steel = 19.1°C
Overall efficiency of furnace = 50%
Input current = 5700 A, Resistance and Reactance of transformer referred to secondary are 0.008 and 0.014 ohm respectively. **(12 Marks)**

2 a. Explain the principle of Dielectric Heating. Derive the mathematical expression of power consumed in such process. State important applications of dielectric heating. **(06 Marks)**

b. A low frequency induction furnace, whose secondary voltage is maintained constant at 10 volts, takes 400 kW at ac power factor when the hearth is full. Assuming the resistance of the secondary circuit to vary inversely as the height of the charge and reactance to remain constant, find the height up to which hearth should be filled to obtain maximum heat. **(08 Marks)**

c. Explain High Frequency Eddy current heating. **(06 Marks)**

3 a. With a neat sketch, explain flash butt welding and spot welding. **(06 Marks)**

b. State and explain laws of illumination. **(06 Marks)**

c. Discuss the factors influences the electrodeposition process. **(08 Marks)**

4 a. With a neat sketch, explain the construction and working principle of a low pressure mercury vapour lamp. **(06 Marks)**

b. Explain the principle of street lighting, types of street lighting and lamps used in street lighting. **(06 Marks)**

c. A 60 CP, 250 Volt metal filament lamp has a measured candle power of 71.5 CP at 260 Volts and 50 CP at 240 volts.
i) Find the constant for the lamp in the expression $C = aV^b$ where C = candle power and V = voltage.
ii) Calculate the change of candle power per volt at 250V. Determine the percentage variation of candle power due to a voltage variation of $\pm$ 4% from the normal value. **(08 Marks)**

PART – B

5 a. State the main requirements of an ideal traction system. **(06 Marks)**

b. Explain the various systems of track electrification. **(08 Marks)**

c. Define : (i) Crest speed (ii) Average speed and (iii) Schedule speed. Discuss the factors which affect the schedule speed of a train. **(06 Marks)**

6 a. Draw a main-line service speed-time curve. Derive an expression for maximum speed of a train interms of total distance travelled acceleration & retardation by using a suitable simplified s-t curve. **(06 Marks)**

b. A train is required to run between two stations 1.6 km apart at an average speed of 40 km/h. The acceleration, retardation during coasting and braking are 2 km/h/s, 0.16 km/h/s and 3.2 km/h/s respectively. Assuming quadrilateral approximation of speed-time curve, determine

i) The duration of acceleration, coasting and braking periods and

ii) The distance covered during these periods. **(08 Marks)**

c. Explain mechanism of Train movement and define (i) Adhesive weight and (ii) Co-efficient of adhesion. **(06 Marks)**

7 a. Define specific energy output and specific energy consumption. Derive the expression of specific energy o/p and specific energy consumption using simplified speed-time curve. **(10 Marks)**

b. Discuss the mechanical features and electrical characteristics of electric motors used for traction work. **(10 Marks)**

8 a. A tramcar is equipped with two motors which are operating in parallel. Calculate the current drawn from the supply mains at 500 V when the car is running at a steady speed of 40 kmph and each motor is developing a tractive effort of 1800 Newtons. Resistance of each motor is 0.4 ohm. The friction, windage and other losses may be assumed as 3200 watts per motor. **(06 Marks)**

b. What is Hybrid vehicle? Explain configuration and performance on hybrid vehicle. **(08 Marks)**

c. What are the Advantages and disadvantages of Regenerative braking of electric traction motor? **(06 Marks)**

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10EE73

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
High Voltage Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the need for generation of very high voltages in the laboratory. **(06 Marks)**

b. What are the advantages of transmitting electrical power at high voltages? **(06 Marks)**

c. Describe the various components of electrostatic precipitator (ESP) and its principle of working. **(08 Marks)**

2 a. Write the preferred properties of gaseous dielectric for high voltage applications. Give any three examples of gaseous dielectric. **(06 Marks)**

b. Explain the process of ionization by collision and hence obtain the Townsend's current growth equation. **(08 Marks)**

c. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8} A at 8 KV at a distance of 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α. **(06 Marks)**

3 a. State and explain Paschen's law. **(06 Marks)**

b. Explain the following breakdown mechanism in solid:
i) Streamer breakdown. ii) Electromechanical breakdown. **(14 Marks)**

4 a. Explain with a neat figure, how cascade transformers generate high ac voltages. **(08 Marks)**

b. Explain the principle of operation of a resonant transformer. **(06 Marks)**

c. A Cockcroft-Walton type voltage multiplier circuit has eight stages with capacitances all equal to 0.05 μF. The supply transformer secondary voltage is 125 KV at a frequency of 150 Hz. If the load current to be supplied is 5 mA. Find
i) The voltage drop and regulation.
ii) The optimum number of stages for minimum voltage drop. **(06 Marks)**

PART – B

5 a. Explain the Marx circuit arrangement for multistage impulse generator. **(08 Marks)**

b. Explain the operation of a trigatron gap. **(06 Marks)**

c. A 12-stage impulse generator has 0.126 μF capacitors. The wavefront and wave tail resistances connected are 800 ohms and 5000 ohms respectively. If the load capacitor is 1000 pF, find the front and tail lines of the impulse wave produced. **(06 Marks)**

6 a. With a schematic diagram, explain the principle of operation of a generating voltmeter. **(08 Marks)**

b. Explain the Chubb and Forteswe method for measurement of peak value of an ac voltage waveform. **(06 Marks)**

c. Explain the principle of operation of an electrostatic voltmeter for measurement of very high dc and ac voltages. **(06 Marks)**

7 a. Explain the method of balanced detection for locating partial discharges in electrical equipment. **(10 Marks)**

b. Explain how capacitance and $\tan\delta$ can be measured using a Schering bridge. **(10 Marks)**

8 a. Define the following terminologies: i) Disruptive discharge voltage.
ii) Fifty percent Flashover voltage. iii) Impulse voltages. **(06 Marks)**

b. Write brief notes on: i) Testing on insulators. ii) Testing of cables. **(14 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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10EE74

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Industrial Drives and Applications

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Missing data may be suitably assumed.***

PART – A

1 a. What are the advantages of an electrical drive system? **(04 Marks)**

b. Explain clearly the different components of load torque, with its characteristics. **(08 Marks)**

c. A motor equipped with a flywheel is to supply a load torque of 1000 N-m for 10 sec followed by a light load period of 200 N-m long enough for the flywheel to regain its steady-state speed. It is desired to limit the motor torque to 700 N-m. What should be the moment of inertia of fly wheel? Motor has an inertia of 10 kg-m^2. Its no load speed is 500 rpm and the slip at a torque of 500 N-m is 5%. Assume speed-torque characteristic of motor to be a straight line in the region of interest. **(08 Marks)**

2 a. Explain with relevant curves the following classes of motor duty:
i) Short time duty
ii) Intermittent periodic duty
iii) Intermittent period duty with starting **(06 Marks)**

b. Derive an expression for equivalent current for fluctuating and intermittent loadings. **(06 Marks)**

c. Explain with a neat diagram the four quadrant operation of a motor driving a horst load. **(08 Marks)**

3 a. Explain with circuit diagram and relevant waveforms, a single phase fully controlled rectifier, control of a separately excited d.c. motor. **(10 Marks)**

b. A separately excited dc motor rated at 220 volts, 900 rpm, 160 amps has an armature resistance of 0.065 ohms fed from single phase fully controlled rectifier with an ac voltage source of 240 volts, 50 Hz. Assuming continuous conduction, calculate the firing angle for rated motor torque and 900 rpm. **(10 Marks)**

4 a. Explain the process of motoring and regenerative braking characteristic of a chopper controlled series motor. **(04 Marks)**

b. Explain with a neat sketch, the dynamic braking of a separately excited dc motor. **(08 Marks)**

c. With a neat drive circuit of a dc motor, explain the operation of three phase fully controlled rectification control. **(08 Marks)**

PART – B

5 a. Explain with relevant equations the operation of induction motor with unbalanced source voltage. **(08 Marks)**

b. Explain regenerative braking and ac dynamic braking of an induction motor. **(06 Marks)**

c. A 440V, 50 Hz, 4 pole, 1425 rpm induction motor has its parameters referred to stator $R_s = 0.5\ \Omega$, $R_r^1 = 0.4\ \Omega$, $X_S = X_r^1 = 1.2\ \Omega$. Motor is driving a fan load. Calculate the full load current of the motor. Take the value of $X_m = 50\ \Omega$, and induction motor is star connected. **(06 Marks)**

6 a. Explain with block diagram variable frequency control of induction motor. **(06 Marks)**
b. With a neat circuit diagram and relevant waveforms, explain the operation of voltage source inverter drive system. **(08 Marks)**
c. Draw a neat circuit arrangement of static scherbius drive, explain its importance. **(06 Marks)**

7 a. Draw the block diagram of variable frequency control of multiple synchronous motor, and explain. **(10 Marks)**
b. With a neat diagram, explain the operation of self-controlled synchronous motor drive. **(10 Marks)**

8 Write short notes on any two along with their block diagrams:
a. Steel rolling mill drive system
b. Cement mill drives
c. Paper mill drive **(20 Marks)**

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10EE752

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Programmable Logic Controllers

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is PLC? Explain its hardware with the help of a neat block diagram. Mention its advantages and drawbacks. **(10 Marks)**

b. With relevant diagram, explain the operation of Absolute Encoder with incremental encoder. **(10 Marks)**

2 a. What are proximity switches? Explain the different types of proximity switches. **(06 Marks)**

b. What is a Ladder diagram? Explain the conventions to be followed while drawing the ladder diagram. **(06 Marks)**

c. Express half adder using ladder diagram and functional block diagram. **(08 Marks)**

3 a. Implement the operation of 4:1 multiplexer using ladder diagram. **(06 Marks)**

b. Explain how branching and convergence is realized using sequential functional chart. **(06 Marks)**

c. Explain the Jump within Jump operations, with the help of a suitable example. **(08 Marks)**

4 a. Explain structured text implementation of conditional statement, iterative statement. **(08 Marks)**

b. Draw ladder diagram and instruction list (IL) program for a system where there has to be no output when any one of four sensors gives an output, otherwise there is to be an output. **(06 Marks)**

c. Write ladder diagram and instruction list (IL) programming for the following logic functions i) NAND ii) NOR iii) XOR. **(06 Marks)**

PART – B

5 a. Explain the working of a master control relay with the help of an example. **(06 Marks)**

b. Explain the significance of internal relays in PLC operation. With the help of an example, explain the role of internal relay in resetting a latch circuit. **(08 Marks)**

c. Explain one – shot operation with necessary ladder diagram. **(06 Marks)**

6 a. Explain use of counter to extend the range of timer. **(06 Marks)**

b. With a ladder program and timing diagram, explain to start 3 – motors in sequence with some time delay using a single start button. **(08 Marks)**

c. Explain various types of timers and their representation. **(06 Marks)**

7 a. Write a note on up-down counting with necessary ladder diagram. **(08 Marks)**

b. Explain with the ladder diagram usage of timer for flashing the lights on and off as long as there is an output occurring. **(06 Marks)**

c. With the help of ladder diagram and timing diagram, explain how a on-delay timer can be used to produce an off-delay timer. **(06 Marks)**

8 a. Explain Data comparison, Data movement and Arithmetic operations in PLC. **(10 Marks)**

b. Explain 4 – bit shift register with neat ladder diagram and instruction list programming. **(10 Marks)**

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10EE756

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Testing and Commissioning of Electrical Equipments

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What are the standard specifications of a power transformer? **(10 Marks)**

b. Explain the points to be considered in the selection of site and location of power transformer. **(10 Marks)**

2 a. What are the qualities of a good insulating oil? **(04 Marks)**

b. Explain the method of measurement of insulation resistance and polarization index in case of transformer. **(06 Marks)**

c. Explain the procedure of drying out of power transformer. **(10 Marks)**

3 a. Explain the sudden 3 ϕ short circuit test on a three phase generator and how to calculate X'_d, X''_d and X_d or X_q from the sudden three phase short circuit test. **(10 Marks)**

b. State the routine tests required to be done for a synchronous machine. **(10 Marks)**

4 a. Enumerate the various steps of installation of a synchronous machine. **(06 Marks)**

b. Describe the methods of cooling employed in synchronous machines. **(04 Marks)**

c. State and explain the various abnormal conditions in synchronous generators and their effect on the generator. State respective protection. **(10 Marks)**

PART – B

5 a. Explain the high voltage test conducted on the induction motors. **(10 Marks)**

b. Describe a typical preventive maintenance schedule of induction motors. **(10 Marks)**

6 a. Write a brief note on shaft alignment of induction motors. **(05 Marks)**

b. Explain in detail what are the different methods of drying out the induction motors. **(10 Marks)**

c. State the various types of enclosures adopted in induction motors. **(05 Marks)**

7 a. Explain briefly the no – load, blocked rotor and temperature rise tests for induction motors. **(10 Marks)**

b. Explain the layout of a simple short circuit testing and the procedure of conducting the short circuit test on I.M. **(10 Marks)**

8 Write short notes on :

a. Maintenance of SF_6 circuit breaker.

b. Selection of bearings in an induction motor.

c. Testing of transformer oil.

d. Specification of high voltage circuit breaker. **(20 Marks)**

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10EE761

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Power System Planning

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What are the major components of planning process? Briefly explain least cost utility planning. **(08 Marks)**

b. What are the major features of Indian electricity rules, 1956? **(06 Marks)**

c. List the various factors that affect load pattern in a power system. **(06 Marks)**

2 a. Explain various plan options, uncertainties and objectives in a power utility planning process. **(10 Marks)**

b. What is cogeneration? Briefly explain the two basic processes with block diagrams. **(10 Marks)**

3 a. Mention the need and benefits of rural electrification. Briefly explain the components of rural electrification planning. **(08 Marks)**

b. What is the significance of private sector participating in power projects? Mention the major modes of participation. **(08 Marks)**

c. What are the objectives of a sound consumer tariff? **(04 Marks)**

4 a. Describe the major environmental hazards caused by fossil fired thermal plants and the methods to minimize them. **(10 Marks)**

b. Explain the terms 'non utility generation' and 'wheeling'. How wheeling affects system performance? How wheeling contracts are made? **(10 Marks)**

PART – B

5 a. Define power system reliability. Explain how optimal reliability level is determined in power system reliability planning. **(10 Marks)**

b. Describe load prediction by 'Regression analysis'. **(10 Marks)**

6 a. With a figure, explain a centralized computing system for monitoring and controlling a power system. **(10 Marks)**

b. What is power system state estimation? Briefly narrate the basic steps involved in estimating the best state vector. **(10 Marks)**

7 a. Briefly explain optimal power system expansion planning. What is the parameter to be optimized/ minimized in the problem? **(05 Marks)**

b. Mathematically define the objective function and constraints in optimal power system expansion planning. Briefly narrate each component of the objective function and constrains. **(15 Marks)**

8 Write short notes on :

a. Any one mathematical, programming method used for optimal power system expansion planning. **(08 Marks)**

b. Online power flow studies for system operation planning. **(06 Marks)**

c. Supply and demand side options in integrated resource planning. **(06 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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10EE764

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
VLSI Circuits & Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With graphical representation, discuss the relative gate delay and relative cost per gate of BiCMOS, ECL, CMOS and GaAs technologies. **(04 Marks)**

b. Explain the fabrication of nMOS transistor with proper diagrams. **(10 Marks)**

c. With a neat diagram, explain the working of basic nMOS depletion mode transistors. **(06 Marks)**

2 a. Explain three different forms of pull up for inverter with neat circuit diagrams. **(12 Marks)**

b. Explain the working of BiCMOS inverters with and without static current flow. **(08 Marks)**

3 a. With neat diagrams express the Lambda based design rules as applicable to MOS layers, transistors and contacts. **(10 Marks)**

b. Draw the stick diagram and symbolic diagram for a simple nwell based BiCMOS inverters. **(06 Marks)**

c. Draw the stick diagram for CMOS inverters. **(04 Marks)**

4 a. Give the concept of sheet resistance. **(06 Marks)**

b. With a neat diagram, explain the working of an inverting type nMOS super buffers. **(06 Marks)**

c. Explain about BiCMOS drivers. **(08 Marks)**

PART – B

5 a. Discuss the limitations of scaling for interconnect and contact resistance with propagation delay for metal interconnect and electro-optical interconnect models. **(10 Marks)**

b. Determine the scaling factors for the following MOS transistor parameters. Use constant electric field scaling model,
i) Gate area ii) Gate delay iii) Channel resistance iv) Saturation current. **(10 Marks)**

6 a. Explain the structured design approach for a parity generator circuit and draw the nMOS diagram of its basic cell. **(10 Marks)**

b. What is two phase clocking? Draw and explain a combinational circuit to generate a two phase clock. **(10 Marks)**

7 a. Explain the basic bus architecture for 4 bit arithmetic process with neat diagrams. **(10 Marks)**

b. Explain with neat diagram 4×4 barrel shifter. **(10 Marks)**

8 a. Draw the structure of a multiplexer based adder logic with stored and buffered sum output. **(08 Marks)**

b. Define and explain regularity. **(04 Marks)**

c. Show how arithmetic and logical functions are implemented using adder cell. **(08 Marks)**

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