G 5431

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 606 L06 – RENEWABLE ENERGY RESOURCES [EE]

(New Scheme – 2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. What are the advantages of renewable energy sources?
2. Define beam, diffuse and total radiation.
3. Define solar cell, panel and array.
4. Explain the principle of operation of acid fuel cell.
5. Mention the characteristics of wave energy.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Explain the types of turbines used in renewable hydro power.
7. Explain solar heating system.
8. Explain the principle of photovoltaic conversion.
9. Mention the basic principles of wind energy extraction.
10. What are the major components of tidal power plants?

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*

Each question carries 12 *marks.*

11. Explain briefly various renewable energy sources. What are their limitations?

Or

12. Explain the types of generators that are used in renewable hydro power.

Turn over

13. Describe the layout and working of a solar cooking system.

Or

14. Explain the following :

    (a) Solar collectors.

    (b) Solar green house.

    (c) Solar furnace.

15. What are the classifications of Solar PV system? Explain the design of Stand-alone PV System.

Or

16. Explain the semi-conductor materials used for solar cells.

17. Explain the basic components of mind energy conversion system.

Or

18. Describe various fuels used in fuel cells along with chemical reaction involved.

19. Explain the principle of extracting power from waves. Also explain the wave energy conversion devices.

Or

20. Explain the principle and applications of Biomass Conversion Process.

(5 × 12 = 60 marks)

G 5399 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 605—MICROCONTROLLERS AND EMBEDDED SYSTEMS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Write the PSW format of 8051 with individual bit operations.
2. What are the three types of jump instructions in 8051 ?
3. How can we change the default priority of interrupts in 8051 ?
4. Explain briefly the interfacing of ADC with 8051.
5. Discuss the significance of FSR in PIC 16F877.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the memory mapping of 8051.
7. Differentiate the following instructions :

   (a) MOVX and MOVC ; (b) SWAP and XCH.
8. What is the difference between timer and counter ? Explain each bit in TCON.
9. How can an internal RAM be connected to 8051 ?
10. Differentiate RISC and CISC.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. List and explain the function of various SFRs used in 8051.

Or

12. Draw and explain block diagram of an embedded system.

13. Explain the various addressing modes used in 8051 with examples.

Or

14. Which are the various jump and call instructions in 8051 ?

15. What steps are to be taken in programming 8051 to transfer data serially ?

Or

16. Write notes on RS 232 serial bus standard.

17. Explain with neat diagram, the interfacing of an LCD module to 8051. Write the ALP to display the message 'HELLO'.

Or

18. How is an external data RAM connected to 8051 ? Explain with diagram.

19. Explain the interrupt structure in PIC 16F877.

Or

20. (a) Explain various addressing modes used in PIC 16F877.

    (b) Write assembly codes in PIC 16F877 to generate a square wave.

(5 × 12 = 60 marks)

G 5430 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 606 L 05—BIOMEDICAL ENGINEERING (Elective I) [EE]

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Describe the process of sodium pump.
2. Define lead and what are the different types of leads used for ECG.
3. What is meant by Defibrillators ? Discuss about its types.
4. Define (a) residual volume ; (b) tidal volume ; (c) total lung capacity ; (d) vital capacity.
5. With the help of suitable diagrams explain the working and construction of X-ray machine.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. What are the different devices used for protection against electrical hazards ?
7. Draw the curves of ECG and diagnose any firm of disturbance in heart rhythm.
8. How blood pressure is measured by ultrasonic method ?
9. Explain finger tip-oxymeter with suitable block diagram.
10. Explain briefly the different modes of ultrasonic scanning with the help of suitable diagrams.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Explain (a) resistive type transducer ; (b) LVDT type inductive transducer. (6 + 6 = 12 marks)

Or

12. (a) Define electrodes. What are the different types of electrodes.
    (b) How does the blood circulate throughout the body ?

(6 + 6 = 12 marks)

13. Describe the recording set up used in EEG.

Or

14. Describe Heart sounds. What is phonocardiography.

15. What is dialysis ? Also explain the two types of procedures used for doing dialysis.

Or

16. (a) Write notes on artificial heart valves.
    (b) Explain the working of a hear lung machine.

(6 + 6 = 12 marks)

17. With a neat block diagram, explain the working of ventilator. What are the different modes of operation in a ventilator.

Or

18. Write short notes on working of surgical Diathermy.

19. (a) Write short notes on Laser in Medicine.
    (b) Distinguish between Radiography and Fluoroscopy.

(7 + 5 = 12 marks)

Or

20. With a neat block diagram explain the working of a CT machine. Also mention some of its applications.

[5 × 12 = 60 marks]

G 5358 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 602 – INDUCTION MACHINES (EE)

(New Scheme – 2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Draw a circuit of star-delta starter for three phase induction motor.
2. Give a list of losses in three-phase induction motor.
3. Give the applications of repulsion motor.
4. Why is single phase induction motor not self starting?
5. Draw a symbolic circuit of capacitor start induction run single-phase induction motor.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Explain, drawing relevant diagrams, how a rotating magnetic field is produced in case of three-phase induction motor.
7. A 4 pole induction motor has full load speed of 1460 r.p.m. Find out (i) Fractional slip ; (ii) Rotor slip. The supply frequency is 50 Hz.
8. Draw a diagram of single-phase preventer used for three-phase induction motor.
9. Explain the working principle of commutator motor.
10. Give the applications of brushless DC motor.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. Draw the constructional diagrams of (i) Squirrel cage rotor ; and (ii) Slip ring (wound) rotor. Compare squirrel cage rotor with Slip ring (wound) rotor.

Or

12. A 14. 9 kW, 3 Phase, 400 V, 50 Hz, induction motor gave the following readings :

No load test	400 volt	9 Amp	1250 Watt
Blocked rotor test	150 volt	38 Amp	4000 Watt

Draw circle diagram. Take rotor and stator copper losses as equal. Find from the circle diagram (For full load)?

(i) Full load current.

(ii) Power factor.

(iii) Slip.

(iv) Efficiency.

13. Draw a double cage construction of induction motor. State its speciality and give applications.

Or

14. Enlist the different speed controlling methods for three phase induction motor. Drawing a suitable diagram and explain any one method of speed control.

15. Explain the working of Induction generator; draw its torque-speed characteristics; Give its advantages, disadvantages and applications.

Or

16. Draw and explain the equivalent circuit of a single-phase induction motor. Which tests are to be performed to find the parameters of equivalent circuit?

17. What will happen if a plain DC series motor is connected to AC supply? Explain the operation of universal motor and state its applications.

Or

18. Explain the working of hysteresis motor, draw its characteristics curve and give applications.

19. Discuss the detailed construction and explain the working of switched reluctance motor. Also give its applications.

Or

20. Drawing suitable diagrams, explain the working of linear induction motor. Give its advantages, disadvantages and applications.

(5 × 12 = 60 marks)

G 5370 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 603—CONTROL SYSTEMS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Graph sheets and semilog sheets can be provided.

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What is a gyroscope ? What are the different types and their applications ?
2. Differentiate between cascade and feedback compensation.
3. What are minimum and non-minimum phase systems ? Give example for both.
4. Realise lag compensator using operational Amplifier. What is its transfer function ?
5. Draw the step Response of a general second order system for under-damped case and mark the time domain specification on it.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Define Gain Margin and Phase Margin. How it can be obtained from bode plot ?
7. Draw a lag-lead compensating network and Obtain its Transfer function. Draw its pole-zero plot and polar plot.
8. Compare Armature controlled D.C. motor with Field Controlled D.C. Motor.
9. How to obtain the solution of a general continuous homogenies state equation ?
10. Write a note on Discretization of continuous time systems.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Draw the Bode-plot for the Transfer Function with unity feedback and find the gain cross-over frequency and phase cross-over frequency :

$$G(s)=\frac{10}{s(1+0.5s)(1+0.1s)}.$$

Or

12. (a) List the Advantages of Frequency Response plots over time domain plots.

(b) How to determine static Position error Coefficient and static velocity error Coefficients from Bode plot ?

(c) Explain how to determine the Transfer Function of the System from Bode plot.

13. The open loop Transfer Function of a unity feedback Control System is given by $G(s)=\frac{1}{s(s+1)(2s+1)}$. Sketch the polar plot and determine Gain Margin and phase Margin.

Or

14. (a) Define : (i) Encirclement. (ii) Enclosement concept in stability determination.

(b) For the system with $G(s)H(s)=\frac{k}{s(s+1)}$, determine the closed loop system stability using Nyquist Stability Criterion.

15. Design a suitable Compensator using Root Locus Technique for a system with $G(s)H(s)=\frac{k}{s^2(s+1)}$, so that the compensated system has a peak over shoot of 20 %, settling time $\leq$ 4 sec, and steady state error ≤ 0.2.

Or

16. Consider the unity feedback system whose open loop Transfer function is :

$$G(s)H(s)=\frac{k}{s(s+4)(s+80)}.$$

It is desired to have a phase Margin of 33° and velocity error constant k_v = 30 sec^{-1}. Design a lag Compensator using Bode plot.

17. The Transfer Function of the System is :

$$\frac{Y(s)}{U(s)}=\frac{3s^2+2s+7}{s^3+5s^2+12s+5}$$

Express it in controllable canonical Form. Draw its state diagram Also.

Or

18. (a) For the System shown, find its response to unit step input :

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u.$$

Take the initial Condition $x(0)=\begin{bmatrix}0\\ 0\end{bmatrix}$.

(b) Show that eigen values remain stationary under similarity transformation.

19. (a) Obtain the Transfer Function of the system whose state model is

$$\begin{bmatrix}x_1\\ x_2\end{bmatrix}=\begin{bmatrix}1 & 1\\ -2 & -1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}U.$$

$$y=\begin{bmatrix}1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}.$$

(b) What is meant by discretization of continuous time systems ?

Or

20. Determine the unit step Response in closed form for the system given by :

$$x(k+1)=\begin{bmatrix}0 & 1\\ 0 & -1\end{bmatrix}x(k)+\begin{bmatrix}0\\ 1\end{bmatrix}u(k)$$

for all $k \geq 0$ with $x(0)=0$.

(5 × 12 = 60 marks)

19. Consider a second order IIR filter with :

$$H(z) = \frac{1}{\left(1 - \frac{1}{2} z^{-1}\right)\left(1 - 0.45\, z^{-1}\right)}$$

Find the effect on quantization on pole locations of the given system function in direct form and in cascade form. Assume b = 3 bits.

Or

20. Elaborate the architecture of TMS 320C54 DSP processor.

[5 × 12 = 60 marks]

G 5384 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 604—DIGITAL SIGNAL PROCESSING (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Write short notes on sampling theorem.
2. Find the 4-point DFT of the sequence $x(n) = \{1, 1, -1, -1\}$.
3. Comment on the reason for analog approximation to design a digital filter.
4. State the effect of having abrupt discontinuity in frequency response of FIR filters.
5. Compare fixed point and floating point arithmetic ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Show that if the input $x[n]$ to a discrete-time LTI system is periodic with period N, then the output $y(n)$ is also periodic with period N.
7. Explain the Overlap add and Overlap save method.
8. Design a digital second order low pass Butterworth filter with cut-off frequency 2200 Hz using bilinear transformation. Sampling rate is 8000 Hz.
9. Discuss the design procedure of FIR filter using frequency sampling method.
10. Represent the following numbers in floating point format with five bits for mantissa and three bits for exponent.
    (a) 7_{10}. (b) 0.25_{10}.
    (c) -7_{10}. (d) -0.25_{10}.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Let $x(n) = a^{|n|}$, $a > 0$.

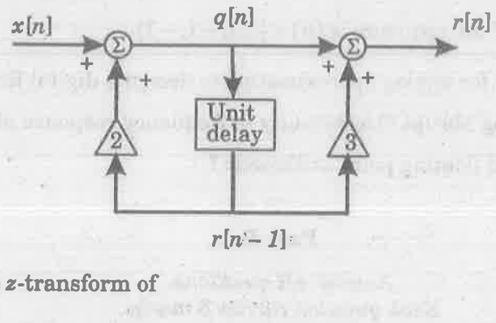
(a) Sketch $x[n]$ for $a < 1$ and $a > 1$.

(b) Find $X(z)$ and sketch the zero-pole plot and the ROC for $a < 1$ and $a > 1$.

(4 + 8 = 12 marks)

Or

12. (a) Consider the discrete-time system in Figure below. Write a difference equation that related the output $y[n]$ and the input $x[n]$.



(b) Find the inverse z-transform of

$$X(z) = \frac{z}{z(z-1)(z-2)^2} \quad |z| > 2.$$

(6 + 6 = 12 marks)

13. (a) Derive the butterfly diagram of 8 point radix - 2 DIF FFT algorithm and fully label it.

(b) Perform the linear convolution of the sequence using DFT method :

$x(n) = \{1, -1, 1, -1\}$ and $h(n) = \{1, 2, 3, 4\}$

(8 + 4 = 12 marks)

Or

14. (a) Prove that FFT algorithms help in reducing the number of computations involved in DFT computation.

(b) Compute a 8 point DFT of the sequence using DIT—FFT algorithm

$$x(n) = \underset{\uparrow}{\{1, 2, 3, 2, 1, 0\}}.$$

(4 + 8 = 12 marks)

15. Obtain the direct form I, direct form II and cascade form realization of the following system functions :

$$y(n) = 0.1\,y(n-1) + 0.2\,y(n-2) + 3x(n) + 3.6\,x(n-1) + 0.6\,x(n-2).$$

Or

16. Design a digital Butterworth filter using impulse invariance method satisfying the constraints. Assume T = 1 sec.

$$0.8 \le \left|H\left(e^{j\omega}\right)\right| \le 1 \qquad 0 \le \omega \le 0.2\,\pi$$

$$\left|H\left(e^{j\omega}\right)\right| \le 0.2 \qquad 0.6\,\pi \le \omega \le \pi .$$

17. Design an ideal high pass filter using Hanning window with a frequency response.

$$H_d\left(e^{j\omega}\right) = \begin{cases} 1 \text{ for } \dfrac{\pi}{4} \le |\omega| \le \pi \\ 0 \text{ for } \quad |\omega| \le \dfrac{\pi}{4} \end{cases}.$$

Assume N = 11.

Or

18. (a) Explain with neat sketches the implementation of FIR filters in direct form and Lattice form.

(b) Design a digital FIR band pass filter with lower cut-off frequency 2000 Hz and upper cut off frequency 3200 Hz using Hamming window of length N = 7. Sampling rate is 10000 Hz.

(6 + 6 = 12 marks)

Turn over

18. Draw the Bode plot for the transfer function with unity feedback and find the gain crossover frequency and phase cross over frequency :

$$G(s) = \frac{10}{s(1+0.5s)(1+0.1s)}.$$

19. Determine the closed loop stability using Nyquist stability criterion, for the system with unity feedback. The open loop transfer function is given as :

$$G(s) = \frac{1}{s^2(1+s)(1+2s)}.$$

Or

20. (i) What are Synchro's. With suitable schematic diagram and waveforms explain its working.
(ii) What are the merits and demerits of a D.C. servomotor ?

(5 × 12 = 60 marks)

G 5170 **(Pages : 4)** **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

CONTROL SYSTEM—I (E)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Graph sheets and Semi-log sheets is to be provided.

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Distinguish between open-loop and closed-loop system. Give *two* examples for each systems.
2. Define what is a 'system'. What is meant by feedback ? Give *three* applications of feedback control systems.
3. Define the term 'block' in control systems. List the different connection of block and represent them through figures.
4. What are the different test signals ? Represent any *three* of them graphically and mathematically.
5. Draw the step response of a general second order system for underdamped case and mark the time domain specification on it.
6. A unity feedback system has the forward path transfer function $G(s) = \frac{10}{(s+1)}$. Find the steady-state error for $r(t) = t$ and the generalised error coefficients.
7. Define minimum phase and non-minimum phase transfer functions and give one example to each.
8. What is meant by frequency response ? List the different types of frequency response characteristics. What are the advantages of frequency response methods ?
9. Compare Armature Controlled D.C. motor with field controlled D.C. motor.
10. What are the different types of stepper motors ? List their applications.

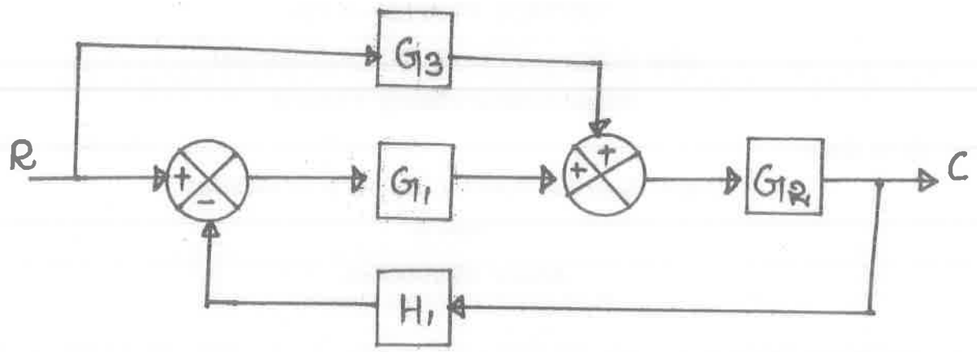
(10 × 4 = 40 marks)

Turn over

Part B

Each question carries 12 marks.

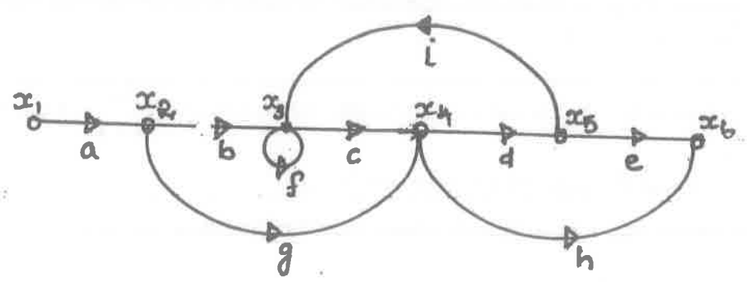
11. (i) For the block diagram shown find $\frac{C}{R}$ by block diagram reduction method :



(ii) What is meant by modelling of a system ? List the commonly used models and their advantages.

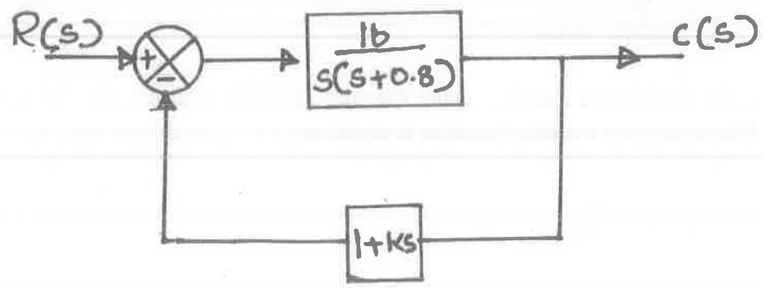
Or

12. (i) For the signal flow graph. Find x_6/x_i.



(ii) Define the terms (a) Loop ; (b) Path ; (c) Mixed node ; (d) Banc rules of a signal flow graph.

13. Determine the value of 'k' such that the damping ratio is 0.5 for the system shown in figure. Also calculate the values of risetime and maximum overshoot for a step input :



Or

14. A certain unity negative feedback control system has the following path transfer function :

$G(s)=\frac{k(s+a)}{(s+b)^2}$. When the system is subjected to a unit step input, it is observed that the steady-state error is 0.25. The system is to have a natural frequency of oscillation w_n = 2 rad/sec and damping factor $\varepsilon = 0.6$. Determine the value of k, a and b.

15. The Forward path transfer function of a certain feedback system is given by :

$G(s)H(s)=\frac{k}{s\left(s^2+2s+2\right)}$. Draw the root locus for $0 \le k \le \infty$.

Or

16. The open-loop transfer function of a unity feedback system is given by :

$G(s)=\frac{k}{(s+2)(s+4)\left(s^2+6s+25\right)}$. By applying Routh Hurwitz criterion, discuss the stability of the closed loop system as function of 'k'.

17. Sketch polar plot and determine the gain margin and phase margin of the unity feedback control system with transfer function :

$G(s)=\frac{1}{s(s+1)(2s+1)}$.

Or

G 5346

(Pages : 3)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 601—POWER GENERATION AND DISTRIBUTION (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What are the functions of economiser and superheater in a thermal power plant ?
2. Differntiate between load factor and demand factor.
3. How do you estimate the power loss in a distribution system ?
4. What is ferroresonance ?
5. What is energy efficient lighting ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain with a simple, block diagram the working of a nuclear power plant.
7. Define the terms plant capacity factor and plant use factor and explain their importance.
8. What are all the design considerations of a distribution feeder ?
9. Explain feeder, distributor and service mains.
10. Explain demand side management.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Write short notes on :

    (a) Penstock.
    (b) Water hammer.
    (c) Draft tube.
    (d) Cavitation.
    (e) Hydrograph.
    (f) Types of water turbines.

    Or

12. Draw and explain the schematic arrangement of a gas turbine plant.

13. (a) A generating station supplies the following loads to various consumers :

Industrial consumer—750 MW

Commercial establishments—350 MW

Domestic power—10 MW

Domestic light—50 MW

If the maximum demand of the station is 1000 MW and no. of KWh generated per year is 50×10^5 find (i) diversity factor ; (ii) annual load factor.

(8 marks)

(b) Differentiate between load curve and load duration curve. (4 marks)

Or

14. What are the various types of tariffs involved in a power generation and distribution system.

15. (a) A d.c. 2 wire distribution XY is 350 metres long and is fed at both ends X and Y at 230 and 232 V respectively. It is loaded as follows (at distances from X) 50 a at 80 m., 100 A at 140 m., uniform loading of 2 A per m. from 250 m. to 300 cm. and 40 a at 270 m. The resistance of each conductor is 0.005 Ω/100 m. Find the point of minimum voltage.

(8 marks)

(b) What is the purpose of interconnection in d.c. ring main distribution ? (4 marks)

Or

16. Explain radial and ring main distribution system.

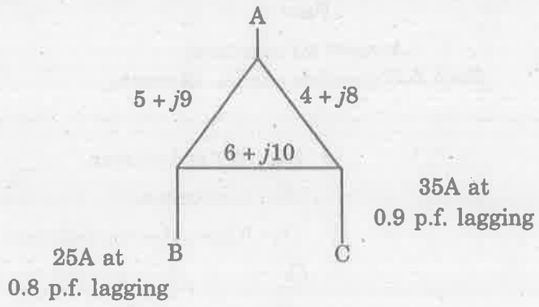
17. A 3ϕ distribution system is as shown in figure. Power is supplied at A at line voltage of 6.6 kV. and balanced loads of 25A per phase at 0.8 lagging p.f. and 35 A per phase at 0.9 lagging p.f. are taken at B and C. The importance of the feeders are :

AB = $5 + j9$ ohms

BC = $6 + j10$ ohms

and CA : $4 + j8$ ohms.

Calculate the voltages at B and C and current in each branch power factor is assumed with respect to voltage at A.



Or

18. Write notes on the following :—

(a) Effets of switching of capacitor banks.

(b) Power loss estimation in distribution systems.

(c) Optimum p.f. for distribution systems.

19. Explain energy auditing in detail.

Or

20. What are the methods of energy saving in motors and lighting systems.

(5 × 12 = 60 marks)