G 1346 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 705—COMMUNICATION ENGINEERING (EE)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What is image frequency ? What are its effects ?
2. What are the functions of pre- and post-equalising pulses ?
3. List three methods of navigation.
4. What is direct sequence spread spectrum in CDMA ?
5. Explain the principle of ASK signalling scheme.

(5 × 3 = 15 marks)

Part B

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

6. Explain the merits and demerits of FM compared to the AM.
7. Define and explain compatibility. Describe the important points considered for maintaining compatibility.
8. An MTI radar operates at 8 GHz with a PRF of 5000 PPS. Calculate the blind speed.
9. Explain the parts and operation of transponders.
10. With a block diagram, explain adaptive Delta modulation scheme.

(5 × 5 = 25 marks)

Part C

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

11. With a neat block schematics, explain the function of each block in the FM transmitter using Armstrong Modulator. What are the advantages gained by using pre-emphasis circuit ?

Or

12. Draw circuit diagrams and explain their functions for :

    (i) Reactance modulator using BJT. (4 marks)

    (ii) AGC circuit for AM. (4 marks)

    (iii) Ratio detector. (4 marks)

13. (a) Explain interlaced scanning and frequency interleaving giving standard values. Describe their advantages. (7 marks)

    (b) Describe the colour burst signal and give its purpose. (5 marks)

Or

14. Describe the principle of NTSC signal. With a neat detailed block diagram, explain the function of each block in a colour NTSC transmitter.

15. Explain how isolation is achieved between the transmitter and receiver of an MTI radar. With a neat block diagram, describe the working of a MTI radar.

Or

16. With necessary diagrams, explain the principle and working and applications of Ground controlled approach system.

17. (a) Describe the altitude and control system of communication satellites. (6 marks)

    (b) Explain different orbits of satellite and their properties. (6 marks)

Or

18. (a) Find the velocity of a satellite at the perigee and apogee of its elliptical orbit in terms of the semi-major axis 'a' and eccentricity 'e'. (6 marks)

    (b) Discuss various antennas and antenna subsystem used in Satellite Communication. (6 marks)

19. Explain the features of BPSK. How it is generated and can be demodulated ? Compare with ASK and FSK.

Or

20. (a) Explain the principle of PCM and its advantages. (6 marks)

    (b) Describe a method of generating PAM using natural sampling. (6 marks)

[5 × 12 = 60 marks]

G 1371 \ (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 706 L01—HVDC TRANSMISSION (Elective II) [EE]

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Why should the electric power tranmission be flexible ?
2. Explain monopolar and bipolar links.
3. What is the function of metalic return tranfer breaker ?
4. What are the merits of TSC-TCR type SVC over FC-TCR type SVC ?
5. Explain the power modulation in MTDC systems.

(5 × 3 = 15 marks)

Part B

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

6. A 6 pulse bridge converter is fed from 220 kV/110 kV transformer with primary connected to 220 kV. Calculate the d.c. output voltage when the overlapping angle is 15° and the delay angle is (i) 30° and (ii) 150°.
7. Explain the different types of DC links.
8. What are the variables on which the DC breakers are characterized ? Explain.
9. Explain the uses of different types of harmonic filters.
10. Describe the current margin method of control in MTDC systems.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. Enumerate the advantages and disadvantages of HVDC system over HVAC system. Discuss the applications of HVDC system.

Or

12. Analyse the Graetz bridge, neglecting overlap.

13. What are the principles of HVDC link control ? Explain the hierarchical levels in controlling a HVDC transmission line.

Or

14. For a 3-phase bridge rectifier, the transformer secondary leakage reactance is 0.3 Ω and the line voltage is 440 V, if the output current is 220 A. Calculate the angle of overlap and the DC output voltage at a delay angle of 15°.

15. What is the principle of surve arrestor ? With a neat diagram, explain a typical arrangement of surge arrestors for a converter pole.

Or

16. Discuss the different types of converter faults and the methods of protection.

17. With a schematic diagram, expalin FC-TCR and its merits.

Or

18. Discuss the design criteria for AC filters in HVDC systems.

19. Describe the series and parallel MTDC systems and compare them.

Or

20. Using state equations, model an AC network. How it can be interfaced with DC systems ? Explain.

(5 × 12 = 60 marks)

G 1376 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 706 L06—SPECIAL ELECTRICAL MACHINES (Elective II) [EE]

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Define (i) ramping and (ii) slew range of a stepper motor.
2. Differentiate between switched reluctance and conventional reluctance motors.
3. Give the differences between switched reluctance and synchronous reluctance motor.
4. List the advantages and disadvantage of brushless DC motors.
5. Write the applications of permanent magnet synchronous motors.

(5 × 3 = 15 marks)

Part B

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

6. Explain the different switching sequence in a stepper motor.
7. Describe the inductance profile of a switched reluctance motor.
8. Sketch and explain the characteristics of synchronous reluctance motors.
9. Explain the working of Hall sensors for brushless DC motors.
10. Draw and explain the torque-speed characteristics of permanent magnet synchronous motors.

(5 × 5 = 25 marks)

Part C

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

11. With neat diagrams, explain the construction and working principle of a stepper motor. Explain its modes of excitation.

Or

Turn over

12. (a) Describe the method of torque production in a variable reluctance stepper motor. (6 marks)

(b) Explain the circuit diagram for driving a stepper motor operating with open loop control. (6 marks)

13. Explain the inverter topologies used in the switched reluctance motor.

Or

14. Draw and explain the characteristics of switched reluctance motor.

15. Explain the constructional details and working principle of synchronous reluctance motor of radial air-gap type.

Or

16. Draw the phasor diagram of the synchronous reluctance motor. Explain the characteristics and give reasons for its shape.

17. Explain the operation of square wave permanent magnet brushless d.c. motor. Derive its e.m.f. equation.

Or

18. Explain, with necessary sketches, the operation of a three-phase brushless motor. Explain its characteristics.

19. How a rotating magnetic field is produced in a permanent magnet synchronous motor. Derive its torque equation.

Or

20. With a phasor diagram, explain the important features of a permanent magnet synchronous motor.

[5 × 12 = 60 marks]

G 1114 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

UTILIZATION OF ELECTRICAL POWER

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the mechanical characteristic of DC and AC motors.
2. Distinguish between Dynamic and Regenerative breaking.
3. Explain trapezoidal speed time curve of electric traction.
4. Explain parallel control of DC series motor.
5. Explain types of high frequency heating.
6. Distinguish between Resistance welding and Arc welding.
7. Explain the requirements of good lighting.
8. Discuss the different types of refrigeration systems.
9. Briefly explain the necessity for energy management.
10. Write short note on Energy Auditing.

(10 × 4 = 40 marks)

Part B

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

11. Explain Electrical Breaking and Plugging.

Or

12. Explain the mechanical characteristics of motors used in a Textile mill and also design the size grating of the motor used.

Turn over

13. Explain the mechanisms of train movement and tractive effort for propulsion of train.

Or

14. An electric train has uniform acceleration from rest at 3 kmphps for 30 seconds, coasting for 60 seconds, breaking period of 30 seconds. The train is moving a uniform down gradient of 2 % tractive resistance 40 N/tonne, rotational inertia effort 10% of dead weight, duration of stops 15 seconds and overall efficiency of transmission gear and motor of 80 %. Calculate the schedule speed and specific energy consumption of run.

15. Describe with neat sketches, the construction, working and limitations of different types of arc furnaces.

Or

16. Explain different types of welding and heating.

17. Distinguish between interior and exterior lighting system of factory lighting.

Or

18. Write short notes on :

    (a) Refrigerant.

    (b) No frost refrigeration.

    (c) Trouble shooting.

19. Discuss the importance of energy management and the techniques applied for energy conservation.

Or

20. Discuss in detail the energy auditing in a textile mill and the various techniques used for energy saving.

(5 × 12 = 60 marks)

G 1137 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

SYSTEM DESIGN WITH MICROCONTROLLERS (E)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Mention the difference between microcontrollers and microprocessors.
2. Explain the PSW Register.
3. Work down the difference between the following instructions :—
   (a) RET and RETI.
   (b) JB b radd and JBC b, radd.
4. Define the interrupt structure of 8051.
5. Write down the sequence of events in CALL execution.
6. Explain the SFR's used in serial communication.
7. What are the different modes in Timer operation of 8051 ?
8. Explain the ADC Interfacing with 8051.
9. Write a brief note on PLCs.
10. Draw the basic block diagram of a Data Acquisition System.

(10 × 4 = 40 marks)

Part B

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

11. Explain the Internal Architecture of 8051 with block diagram.

Or

12. (a) Draw the pin out diagram of 8051 and explain its functions. (8 marks)
    (b) Describe the internal memory organisation of 8051. (4 marks)

Turn over

13. (a) Write a program to add the contents of RAM location 60H, 61H and 62H and store the results in RAM location 41H (MSB) and 40H (LSB).

(7 marks)

(b) Explain the stack operation in 8051. Mention the instructions used for it. What is the default value of stack pointer after reset ?

(5 marks)

Or

14. (a) What are the different Arithmetic and logic instructions used in 8051 programming ?

(6 marks)

(b) Write a program to count the number of odd numbers and even numbers in an array on '*n*' elements (numbers) stored from 4200 h onwards.

(6 marks)

15. Write a program to generate a square wave with an one time of 3ms and an OFF time of 10ms on all pins of port 0. Assume the crystal frequency of 8051 is $22mH_2$.

Or

16. Briefly explain the procedure for the execution of an interrupt in 8051 on the receipt of an interrupt request with an example.

17. Interface a 4k RAM and a 2k EPROM with 8051, The starting address of RAM is 4000H and the starting address of EPROM is 8000H.

Or

18. Describe the LCD display and keyboard Interfacing with 8051.

19. With neat block diagrams and Algorithm, explain the application of 8051 as a frequency counter.

Or

20. Explain now a temperature control system can be implemented using 8051 microcontroller.

[5 × 12 = 60 marks]

G 1335 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 704—MODERN CONTROL THEORY (EE)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Explain the concept of controllability and observability in closed loop control system.
2. State and explain the different non-linearities present in practical control system.
3. Write a short note on different methods of Analyzing non-linear systems.
4. State and explain the "Sampling Theorem" what is anti-alias filter ?
5. What are different selection criteria of PLC ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Write a short note on pole placement design using state variable feedback.
7. Explain the Isocline method of plotting phase-plane trajectories.
8. Derive the describing function of dead-zone non-linearity.
9. Write down the advantages, limitations and applications of Z-transform.
10. Write down the rules for proper construction of ladder diagram.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. Design a full order observer for :

$$A = \begin{bmatrix} 0 & 20.6 \\ 1 & 0 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}; C = [0 \quad 1]$$

Assume the desired eigenvalues of the observer

$\mu_1 = -1.8 + 2.4\,j$; $\mu_2 = -1.8 - 2.4\,j$.

Or

12. Judge the controllability of the system with below mentioned state equation :

$$\dot{x} = Ax + Bu = \begin{bmatrix} -1 & 1 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u.$$

13. Explain the below mentioned terms with neat diagram with respect to phase portrait :

(a) Centre *or* vortex point. (b) Focus point.

(c) Saddle point. (d) Nodal point.

Or

14. Write a short note on Linearization and stability of equilibrium points with reference to the phase portrait.

15. Plot roughly the nature of phase portrait for standard second order system with :

(a) $\zeta = 1$. (b) $\zeta > 1$.

(c) $\zeta < 1$. (d) $\zeta = 0$.

Or

16. Derive the describing function of saturation non-linearity.

17. Given a z.o.h. in cascade with $G_1(s) = (s+2)/(s+1)$ or

$$G(s) = \frac{1 - e^{-Ts}}{s} \frac{(s+2)}{(s+1)}$$

Find the sampled-data transfer function, $G(z)$, if the sampling time T, is 0.5 second.

Or

18. Derive the convolution theorem using Z-transform i.e.,

If $x_1(n) \xleftrightarrow{Z} X_1(Z)$ and $x_2(n) \xleftrightarrow{Z} X_2(Z)$

Then $x_1(n) * x_2(n) \xleftrightarrow{Z} X_1(Z), X_2(Z)$

and ROC is at least the intersection of ROC of $X_1(Z)$ and $X_2(Z)$.

19. Draw the ladder diagram for the following function table :

Inputs—I_1, I_2 *Output*—Q_1, Q_2, Q_3, Q_4

I_1	I_2	Q_1	Q_2	Q_3	Q_4
0	0	1	1	1	1
0	1	0	0	0	0
1	0	0	0	0	0
1	1	1	1	1	1

Or

20. Explain speed control of DC motor using PLC.

(5 × 12 = 60 marks)

G 1323 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 703—DRIVES AND CONTROL

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain different components of load torque.
2. What are the drawbacks of stepped wave inverter fed drive ?
3. Variable frequency control of induction motor is more efficient than stator voltage control. Why ?
4. Why has the static Kramer Drive a low range of speed control ?
5. Why a self-controlled synchronous motor is free from hunting oscillations ?

(5 × 3 = 15 marks)

Part B

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

6. Explain single-phase half-controlled rectifier – fed separately-excited motor with discontinuous conduction.
7. State and explain the issues which should be examined to decide the suitability of regenerative braking for a given traction application.
8. With neat diagram, explain a voltage source inverter feeding a 3-phase induction motor.
9. Explain the operation of VSI fed synchronous motor drive.
10. With a block diagram, explain the operation of an open loop control of a synchronous motor.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. (a) Explain the torque equation of loads with rotational motion. (4 marks)

(b) A 2-pole d.c. series motor runs at 750 r.p.m. when taking 100 A from 220 V supply and with field coils connected in series. Resistances of armature and each field coil are 0.06 and 0.04 Ω respectively. Field coils are now connected in parallel. Determine the speed when :

(i) Torque remains the same.

(ii) Output power remains the same.

Neglect mechanical and core losses and assume linear magnetic circuit.

(8 marks)

Or

12. A 220 V, 960 r.p.m., 12.8 A separately excited d.c. motor has armature circuit resistance and inductance of 2Ω and 150 mH, respectively. It is fed from a single-phase half-controlled rectifier with an a.c. source voltage of 230 V, 50 Hz. Calculate :

(i) Motor torque for $\alpha = 60°$ and speed = 600 r.p.m.

(ii) Motor speed for $\alpha = 60°$ and T = 20 N-m.

13. A 230 V, 1200 r.p.m, 15 A separately excited motor has an armature resistance of 1.2 Ω. The motor is operated under dynamic braking with chopper control. Braking resistance has a value of 20 Ω.

(i) Calculate duty ratio of chopper for motor speed of 1000 r.p.m. and braking torque equal to 1.5 times rated motor torque.

(ii) What will be the motor speed for duty ratio of 0.5 and motor torque equal to its rated torque ?

Or

14. (a) What are the possible control modes of a d.c.-d.c. converter drive ? Explain with neat diagram and waveforms of converter.

(7 marks)

(b) A 220 V, 970 r.p.m., 100 A d.c. separately excited motor has an armature resistance of 0.05 Ω. It is braked by plugging from an initial speed of 1000 r.p.m. Calculate :

(i) The resistance to be placed in armature circuit to limit braking current to twice the full-load values.

(ii) Braking torque.

(5 marks)

15. A 440 V, 50 Hz, 6-pole, 950 r.p.m., Y-connected induction motor has the following parameters referred to the stator :

$R_s = 0.5\Omega, R'_r = 0.4\Omega, X_s = X'_r = 1.2\Omega, X_m = 50\ \Omega.$

The motor is driving a fan load, the torque of which given by $T_L = 0.123\ Wm^2$. Now one phase of the motor fails. Calculate the motor speed and current. Will it be safe to allow the motor to run for a long period ?

Or

16. (a) Explain why stator voltage control is suitable for speed control of induction motor in fan and pump drives.

(6 marks)

(b) How the speed and power factor of a wound rotor induction motor are controlled by injecting a voltage in the rotor circuit ? What should be the relation between the frequency of the injected voltage and the frequency of the rotor induced voltage ?

(6 marks)

17. A 3-phase, 400 V, 50 Hz, 4-pole, 1400 r.p.m., Y-connected wound rotor induction motor has the following parameters referred to the stator :

$R_s = 2\Omega, R'_t = 3\Omega, X_s = X'_t = 3.5\Omega.$

The stator to rotor turns ratio is 2. The motor speed is controlled by static Scherbius drive. The inverter is directly connected to the source. Determine :

(i) The speed range of the drive when $\alpha_{max} = 165°$.

(ii) The firing angle for 0.4 times the rated motor torque and a speed of 1200 r.p.m.

(iii) Torque for a speed of 1050 r.p.m. and firing angle of 95°.

Or

18. (a) Explain the vector control of AC motors. (6 marks)

(b) Describe the slip energy recovery scheme for the speed control of slip ring induction motor. (6 marks)

19. (a) Describe the VSI drive with open loop control. (5 marks)

(b) Discuss the closed-loop control of self-controlled synchronous motor drive fed from CSI. (7 marks)

Or

20. Explain the operation of a.c. traction drive using PWM voltage source inverter induction motor drive with a provision for dynamic braking. What are its main features ?

[5 × 12 = 60 marks]

G 1297 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 701—ELECTRICAL POWER TRANSMISSION (EE)

(New Scheme—2010 Admission onwards/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain Skin effect and Proximity effect.
2. What is Ferranti effect ?
3. What are vibration dampers ? Where are these fixed ?
4. What are the disadvantages of solid or effective earthing ?
5. What are the advantages of HVDC transmission ?

(5 × 3 = 15 marks)

Part B

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

6. Derive an expression for the capacitance of a single phase overhead line.
7. Derive the ABCD constants of the nominal π representation of medium transmission lines.
8. What are the methods of testing insulators ?
9. Define Visual critical voltage and Disruptive critical voltage as related to corona.
10. What are the objectives of FACTs ?

(5 × 5 = 25 marks)

Part C

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

11. (a) Derive an expression for the inductance of a 3-ϕ transposed line with unsymmetrical spacing.

(6 marks)

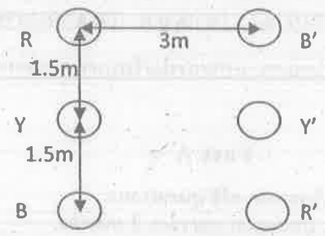
(b) A single phase line has two conductors spaced 1m apart. The radius of each conductor is 0.5 cm. Calculate the loop inductance /km of the line.

(6 marks)

Or

Turn over

12. A symmetrical double circuit 3-ϕ line is to have conductors arranged as shown. Calculate the inductive reactance /phase/km. The line is completely transposed and radius of each conductor is 1.25 cms.



(12 marks)

13. A 50 Hz, 3-ϕ line 80 km long has a total series impedance of $(40 + j\ 125)\Omega$ and shunt admittance of 10^{-3} S .The load is 50 MW at 220 kV with 0.8 pf lag. Find the sending end voltage, current, power factor and efficiency using nominal T configuration.

(12 marks)

Or

14. (a) A 33 kV 3-ϕ, transmission line has parameters A = D = $1\angle 0$, B = $11.18\angle 63.43$. The line is to deliver 7.5 MVA at 0.85 pf lag at the load end. The receiving end voltage is 32 kV. How much active and reactive power is to be dispatched from the sending end.

(8 marks)

(b) What is a tuned power line ? (4 marks)

15. (a) What is string efficiency ? What are the methods to improve it ? (6 marks)

(b) A 3-core 3-ϕ metal sheathed cable has :

(i) capacitance of 1μF between shorted conductors and sheath and

(ii) Capacitance between two conductors shorted with sheath and the third conductor as 0.6μF . Find the capacitance/phase and the charging current if the voltage is 66 kV, 50 Hz.

(6 marks)

Or

16 (a) Describe any *one* method of locating faults in underground cables. (5 marks)

(b) An overhead line with stranded conductors is supported on two poles 200 m apart having a difference in level of 10 m. The conductor diameter is 2 cms and weighs 2.3 kg/m. Calculate the sag at the lower support, if wind pressure is 57.5 kg /m^2 of projected area and factor of safety is 4. The maximum tensile strength of copper is 4220 kg/cm^2.

(7 marks)

17 (a) Explain the single bus bar with sectionalisation and double bus bar schemes in substations.

(6 marks)

(b) A 132 kV, 3-ϕ 50 Hz overhead line, 50 km long has a capacitance to earth of 0.0157 μF/km. Determine the inductance and kVA rating of the arc suppression coil suitable for it.

(6 marks)

Or

18 (a) A 3-ϕ, 220 kV 50 Hz line consists of 1.2 cms radius conductors spaced 2m apart at the corners of an equilateral triangle. Calculate the disruptive critical voltage between lines. Irregularity factor is 0.96, temperature 20°C, Pressure 72.2 cms of Hg, Dielectric strength of air 21.1 kV(rms)/cm.

(7 marks)

(b) What are the disadvantages of working with ungrounded neutral ? (5 marks)

19 (a) What is an UPFC ? What are its advantages ? (6 marks)

(b) Discuss about the different kinds of DC links in HVDC transmission. (6 marks)

Or

20 Write short notes on :

(i) Static VAR Compensator.

(ii) Thyristor Controlled Reactor and

(iii) Thyristor Switched Capacitor.

(3 × 4 = 12 marks)

[5 × 12 = 60 marks]

G 1310 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 702—SYNCHRONOUS MACHINES (EE)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Mention the advantages of fractional slot winding.
2. Write the different effects of armature reaction.
3. Explain the causes of hunting. How they can be reduced ?
4. What are the advantages of installing a synchronous condenser in an electrical system ?
5. Mention the different types of exciter systems.

(5 × 3 = 15 marks)

Part B

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

6. Explain single layer and double layer windings.
7. Explain the differences between cylindrical-rotor theory and two-reaction theory.
8. Discuss any *two* methods of synchronizing an alternator to the mains.
9. Derive an expression for the output power of cylindrical rotor alternator connected to infinite bus in terms of excitation voltage, bus bar voltage and load angle.
10. Discuss any *one* type of excitation method suitable for a large alternator.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. Using neat figures, explain the various types of armature windings suitable for a 3-phase synchronous machine.

Or

12. Derive an e.m.f. expression for an alternator from fundamentals showing clearly the expressions for pitch and distribution factors. Determine, therefrom, the ratio of induced e.m.fs of n^{th} harmonic to fundamental. Can we adopt short-chording for single layer winding ?

13. (a) Develop the e.m.f. method of determining the voltage regulation and hence show that the synchronous reactance consists of two components of reactances.

    (b) An alternator has a synchronous reactance of 20% and negligible resistance. Calculate its voltage regulation when working at full-load (i) 0.8 p.f. lag ; (ii) 0.8 p.f. lead ; (iii) u.p.f.

Or

14. (a) Explain how the Potier triangle can be drawn with the help of *occ* and any two points on the *zpfc*.

    (b) Describe the load magnetisation curve of a synchronous machine. Explain the differences between Potier reactance x_p and armature leakage reactance x_{al}.

15. (a) Explain why synchronous motor is not self-starting ?

    (b) A 3-phase, 600 kW, 4 kV, 180 r.p.m., 50 Hz synchronous motor has per phase synchronous reactance of 1.2 Ω. At full-load the torque angle is 20° electrical. If the generated back-e.m.f. per phase is 2.4 kV, calculate the mechanical power developed. What will be the maximum power developed ?

Or

16. Two synchronous generators are connected in parallel. Generator A has induced e.m.f. of $13000 \angle 22.6^\circ$ and reactance of 2 ohms/phase. Generator B has e.m.f. of $12500 \angle 32.5^\circ$ and has a reactance of 3 ohms/phase. Calculate the synchronizing power and torque assuming star connection, 50 Hz and no-load operation. The machines have 6 poles.

17. (a) Compare the performance of a synchronous generator connected to an infinite bus with that of an isolated alternator operating on its own load.

    (b) An alternator connected to infinite bus, is operating at unity power factor at half-full load. With the field current remaining constant, steam input is increased till the alternator begins to operate at full-load. Under this condition, what will happen to the power factor and reactive power flow ?

Or

18. A 5 MVA, 10,000 V, 1500 r.p.m., 3 ϕ, 50 Hz alternator is operating on infinite busbar. Calculate the synchronous power per mechanical degree of angular displacement at :

    (a) No-load.

    (b) Full-load at rated voltage and 0.8 p.f. lagging. Also find synchronous torque for a 5° mechanical displacement in each case, X_s is 20%.

19. The excitation of 415 V, 3 ϕ, mesh connected synchronous motor is such that the induced e.m.f. is 520 V. The impedance per phase is 0.5 + *j*4 ohms. If the friction and iron losses are constant at 1000 W, calculate the power output, line current, power factor and efficiency for maximum power output.

Or

20. With neat diagrams, explain the constructional details and working principle of brushless alternator. What are its advantages and applications ?

(5 × 12 = 60 marks)