G 1703 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

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 briefly.*
Each question carries 3 *marks.*

1. What do you mean by GMD ?
2. Discuss about the ABCD constants for a short transmission line.
3. What do you mean by sag ?
4. Define the term critical disruptive voltage.
5. Compare TSR and TSC.

(5 × 3 = 15 marks)

Part B

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

6. Discuss about the transposition of lines.
7. Find the ABCD constants of a transmission line based on Nominal T method.
8. Discuss about the string efficiency and methods to improve it.
9. Explain the radio interference of corona.
10. Briefly explain the objectives of FACTS technology.

(5 × 5 = 25 marks)

Part C

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

11. Derive the expression for inductance of three phase transmission lines.

Or

12. Derive the expression of capacitance of single phase line.

Turn over

erive the π equivalent of long lines.

Or

e following data refers to a single-phase short line operating at 50 Hz with the following mixed d conditions :

Line length = 10 km.
Line impedance = 0.5 $\angle 60°$ ohm/km.
Load side power = 316.8 kW
Load side PF = 0.8 (lag)
Load bus voltage = 3.3 kV

nd % voltage regulation and sending and voltage line loss and sending end p.f.

3 kV, 3-phase underground cable, 4 km. long, uses three single core cables. Each of the conductor s a diameter of 2.5 cm. and the radial thickness of insulation is 0.5 cm. The relative permittivity he dielectric is 3.0. Determine (a) Capacitance of cable/phase ; (b) Charging current/phase ; Total charging KVAR ; (d) Dielectric loss/phase if the power factor of the unloaded cabel is 0.02; max. stress in the cable.

Or

ve that a transmission line conductor between two supports at equal heights takes the form of tenary. Deduce expressions for (i) total length of conductor and (ii) tension at ends in terms of n length horizontal tension, max. sag and weight of conductor per unit length.

lain about the different types of sub-stations.

Or

d the corona characteristics of a 110 kV, 50 Hz, 3 phase transmission line 175 km. long consisting nree 1 cm. dia. stranded copper conductors spaced in 3 meter delta arrangement. Temperature C. and barometric pressure is 74 cm., M = 0.85, M_V for local corona = 0.72, M_V for general ona = 0.82.

cuss in detail about the types of HVDC links.

Or

lain about :

a) Interline power flow controller. (4 marks)

b) Thyristor controlled series capacitor. (4 marks)

c) Thyristor controlled series reactor.. (4 marks)

[5 × 12 = 60 marks]

718

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 702—SYNCHRONOUS MACHINES (EE)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Three Hours

Maximum : 100 Marks

Part A

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

Discuss the special features of salient pole field structure.

Discuss the necessity of parallel operations of alternators.

What do you mean by synchronizing ?

Explain inverted V curve.

Enumerate the different types of excitation systems.

(5 × 3 = 15 marks)

Part B

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

Derive the emf equation of salient pole alternator.

Discuss the reasons for the variation in terminal voltage.

400 V, single-phase synchronous motor gives a net output mechanical power of 7.35kW and operates at 0.92 p.f. lagging. Its effective resistance is 0.7 Ω. If the iron and mechanical losses are 50 W and excitation losses are 750 W, calculate (i) armature currents ; (ii) commercial efficiency.

Explain the effects of excitation of armature current and power factor in V-curves.

Discuss about the constructional features of brushless alternators.

(5 × 5 = 25 marks)

Part C

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

Explain in detail about the classifications of armature windings of an alternator with the help of neat diagrams.

Or

Turn over

Calculate the rms value of the induced emf per phase of a 10 pole, 3ϕ, 50 Hz alterantor with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150°. The flux per pole has a fundamental component of 0.12 Wb and a 20 % third harmonic component.

A 3-phase, star-connected, 1000 kVA, 11000 V alternator has rated current of 52.5 A. The a.c. resistance of the winding per phase is 0.45 Ω. The test results are given below :

OC Test : Field current = 12.5 A, voltage between lines = 422 V

SC Test : Field current = 12.5 A, line current = 52.5 A,

Determine the full-load voltage regulation of alternator (a) 0.8 p.f. lagging ; (b) 0.8 p.f. leading.

Or

A 1500 kVA, 11 kV, 50 Hz, star-connected synchronous generator is tested by operating it is a synchronous motor on no-load. The results are as follows :

(a) When operated as a synchronous motor on no-load, the power input to the motor is 55.8 kW and the armature line current is 70 A.

(b) Excitation of 38.6 A at 250 dc gives the normal open circuit voltage.

(c) DC resistance test : DC line voltage 17.5 V and dc line current 70 A.

Take effective resistance 1.6 times the dc resistance. Determine the efficiency of the machine on 50 % of full load and 0.75 pf (lag).

Discuss the starting methods of synchronous motors.

Or

A 200 kVA, 3-phase, 8 pole alternator runs at 750 rpm in parallel with other machines on 6000 V bus-bars. Find synchronising power on full load 0.8 p.f. lagging per mechanical degree of displacement and the corresponding synchronising torque. The synchronous reactance is 6 ohms per phase.

Explain the power angle characteristics of cylindrical rotor and salient pole machines.

Or

Explain the symmetrical short circuit of unloaded alternator during steady-state with waveforms.

Explain the operation and voltage regulation of brushless alternator.

Or

Discuss in detail about excitation limits and exciter response of brushless alternator.

(5 × 12 = 60 marks)

G 1733 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 703—DRIVES AND CONTROL (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. Derive the torque equation of an electric drive.
2. Discuss about the free-wheeling interval of a chopper fed separately excited d.c. motor.
3. Explain the dynamic braking of VST controlled IM drive.
4. Explain the induction motor operation with an injected voltage in its rotor.
5. Discuss about the important features of traction drive.

(5 × 3 = 15 marks)

Part B

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

6. Discuss about the nature of load torques.
7. Explain in detail about the drawbacks of rectifier fed d.c. drive.
8. Discuss about the features of variable frequency control of IM drive.
9. Compare CSI and VST fed drive.
10. Brief the salient features of DC traction using PWM VST-SCIM drive.

(5 × 5 = 25 marks)

Part C

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

11. Derive an expression for the moment of inertia of the flywheel mounted on a non-reversible drive.

Or

Turn over

12. A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06 Ω. It is fed from a single-phase fully controlled rectifier with an a.c. source voltage of 230 V, 50 Hz. Assuming continuous conduction, calcuate :

    (i) Firing angle for rated motor torque and 750 rpm.

    (ii) Firing angle for rated motor torque and 500 rpm.

    (iii) Motor speed for $\alpha = 160°$ and rated torque.

13. Explain the multiquadrant operation of a dual converter fed DC motor drive.

Or

14. Explain the working of a three-phase half controlled bridge drives in motoring and inverter mode of operation.

15. A 2.8 kW, 400 V, 50 Hz, 4 pole, 1370 rpm delta-connected squirrel-cage induction motor has following parameters, referred to stator. $R_S = 2\ \Omega$, $R_r = 5\ \Omega$, $X_S = X_r = 5\ \Omega$, $X_m = 80\ \Omega$. Motor speed is controlled by stator voltage control. When driving a fan load its runs at rated speed at rated voltage. Calculate (i) motor terminal voltage, current and torque at 1200 rpm and (ii) motor speed, current and torque for the terminal voltage of 300 V.

Or

16. Explain the multiquadrant operation of VSI fed induction motor drive.

17. Explain the operation of static Scherbius drive.

Or

18. A 440 V, 50 Hz, 970 rpm, 6 pole Y-connected 3-phase wound rotor induction motor has following parameters refered to stator :

    $R_S = 0.1\ \Omega, R'_r = 0.08\ \Omega, X_S = 0.3\ \Omega,\ X'_r = 0.4\Omega.$

    The motor is now controlled by injecting a voltage into its rotor.

    (i) Calculate the motor torque for a speed of 1200 rpm when a voltage $15 \angle 0°$ is injected in to the rotor. Ignore X_m.

    (ii) What should be the magnitude and phase of injected voltage so that the motor produces same torque at 1200 rpm and operates at unity power factor ?

19. Discuss in detail about the modes of variable frequency control of synchronous motor.

Or

20. Explain in detail about DC and AC traction using PWM-VSI-SCIM drive.

(5 × 12 = 60 marks)

G 1747 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

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. Define complete state controllability, output controllability and observability.
2. Explain limit cycle. How they are classified ?
3. Define the concept of stability and instability in the sense of Lyapunov.
4. State and explain Sampling theorem.
5. Draw any three symbols used in ladder diagram indicating their meanings.

(5 × 3 = 15 marks)

Part B

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

6. $$\begin{bmatrix} X_1' \\ X_2' \\ X_3' \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 \\ -2 & -3 & 0 \\ 0 & 2 & -3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} u$$

$$Y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix}.$$

Check whether the given system is controllable and observable using Kalman's test.

7. Determine the location and types of singular points for the non-linear system described by $\ddot{x} + 8\dot{x} + x^2 = 0$.
8. How singular points are classified ? Show the phase plane portrait for each case.

Turn over

9. The characteristic equation for a system is $F(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$. Predict the stability of the system by Jury's test.

10. Explain the need of redundancy in PLC.

(5 × 5 = 25 marks)

Part C

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

11. Check for the complete state controllability and complete observability for a linear time invariant system described by the state model :

$$\dot{X} = \begin{bmatrix} -7 & -2 & 6 \\ 2 & -3 & -2 \\ -2 & -2 & 1 \end{bmatrix} X + \begin{bmatrix} 1 & 1 \\ 1 & -1 \\ 1 & 0 \end{bmatrix} u$$

$$Y = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix} X.$$

Or

12. Design a full order observer for the linear system :

$$X' = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -0.5809 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 4.4537 & 0 \end{bmatrix} X + \begin{bmatrix} 0 \\ 0.9211 \\ 0 \\ -0.3947 \end{bmatrix} u$$

$$Y = [1 \quad 0 \quad 0 \quad 0] X.$$

The desired Eigen values are 0, 0 –2.11, 2, 11.

13. Draw the phase plane trajectory using delta method for the system $\ddot{x} - 2\dot{x} + 5x = 0$, starting from $x_1(0) = 2, x_2(0) = 2$.

Or

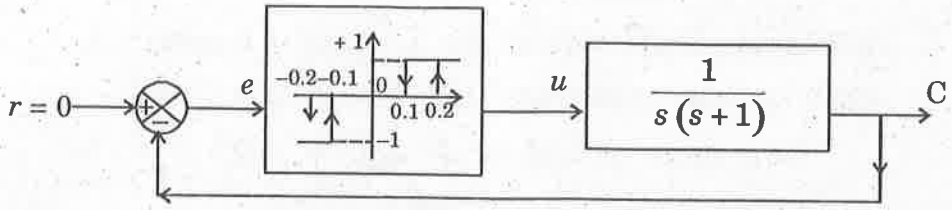
14. A system is described by $\ddot{e} + 2\xi\omega_n\dot{e} + \omega_n^2 e = 0$ where $\xi = 0.15$, $\omega_n = 1$ rad/sec. $e(0) = 1.5$ $\dot{e}(0) = 0$! Determine the singular points. Construct the phase trajectories, using method of isoclines.

15. Using Lyapunov's method, investigate the stability of the system :

$$\dot{X} = \begin{bmatrix} -1 & 0 \\ 1 & -3 \end{bmatrix} X.$$

Or

16. A second order servo containing a relay with dead-zone and hysteresis is shown in the diagram below. Obtain the phase-trajectory of the system for the initial conditions $e(0) = 0.65, \dot{e}(0) = 0$. Does the system have a limit cycle ? Determine its amplitude and period :



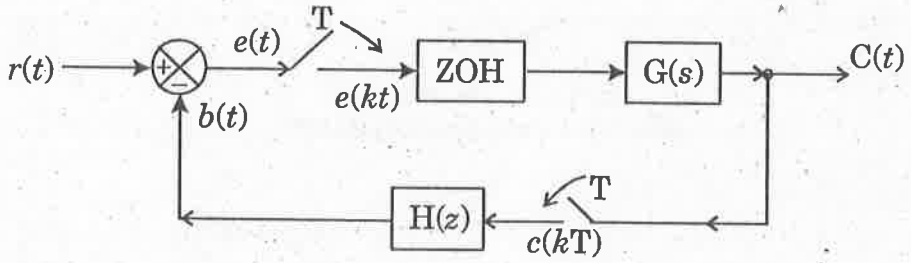
17. State model of a discrete time system is given by :

$$X(k+1) = AX(k) + BU(k)$$
$$Y(k) = CX(k) + DU(k)$$

Determine its transfer function.

Or

18. For the sampled data feedback system with a digital network in the feedback path as shown in the block diagram below, find $\frac{C(z)}{R(z)}$.



19. Explain PLC programming languages. Draw a ladder diagram to implement the following logic :

$$Y = A\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D} + \bar{A}\bar{B}CD + \bar{A}B\bar{C}D.$$

Or

20. With necessary diagrams, discuss PLC, its architecture and I/O modules.

(5 × 12 = 60 marks)

G 1760 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

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 a Mixer ? State its limitations and applications.
2. What is blanking pulse ? Explain.
3. What is the concept of GCA ? Explain.
4. Mention the band of frequencies useful for satellite communication.
5. What is Delta modulation ? Explain.

(5 × 3 = 15 marks)

Part B

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

6. What is the concept of AGC ? Explain in detail with diagrams.
7. Define and explain composite video signal. Mention its applications.
8. Write simple radar range equation. State its limitations and applications.
9. Define uplink and down link. Explain with examples.
10. Define and explain the parameters of eye pattern.

(5 × 5 = 25 marks)

Part C

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

11 Draw a neat block diagram of Tuned Radio frequency receiver and explain its concept in detail. Differentiate it from super heterodyne receiver.

Or

Turn over

. Draw a neat block diagram of BJT reactance modulator and explain in detail.

. (a) Define and explain the standards of TV in detail.

(b) Compare and contrast PAL and NTSC.

Or

. Draw a neat cross sectional diagram of Image orthigon tube and explain it in detail.

. Derive Radar range equation and explain its application in detail. Show that the equation is not accurate.

Or

. Differentiate CW radar from pulsed radar. Draw a neat diagram of a FM CW radar system and explain in detail.

. (a) Discuss the effect of solar eclipse in detail.

(b) Explain FDMA with a neat block schematic.

Or

. Write short notes on :

(a) TT and C.

(b) Transponder.

(c) Geostationary orbit.

(d) Antenna subsystem.

. Explain the concept of ADC and PCM with diagrams.

Or

. (a) Give an account on "M ary PSK".

(b) Explain the concept of BASK with diagrams.

[5 × 12 = 60 marks]

G 1789 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Seventh Semester

Branch : Electrical and Electronics Engineering

EE 010 706 L02—INDUSTRIAL INSTRUMENTATION (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. A strain gauge has a resistance of 120 Ω. Its gauge factor is 2. The strain gauge is connected in series with a ballast resistance of 120 Ω across a 6 V d.c. supply. Calculate the difference between the output voltage with no stress applied and a stress of 240 MN/m^2. The Modulus of elasticity is 200 GN/m^2.
2. What are hydrometers ?
3. How are level sensors selected ?
4. What is the working principle of force balance pressure gauges ?
5. Briefly describe LDR.

(5 × 3 = 15 marks)

Part B

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

6. Describe pneumatic force meter.
7. Discuss the functioning of radiation densitometer.
8. Write a short note on Microwave level switches.
9. Discuss the calibration of pressure measuring instruments.
10. Comment on temperature measurement considerations.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. With neat sketches, explain the working of inline rotating torque sensor and inline stationary torque sensor.

Or

12. Explain the working of (a) LVDT ; (b) Eddy current tachometer. (2 × 6 = 12 marks)

13. What are different types of densitometers ? Explain the working of refractometric densitometer.

Or

14. Write a detailed note on pH measurement with special emphasis on glass electrode pH measurement.

15. Discuss in detail three direct methods of level measurement.

Or

16. Write notes on :

    (a) Air purge system. (6 marks)

    (b) Liquid purge system. (6 marks)

17. Explain in detail electrical pressure transducer.

Or

18. Write notes on :

    (a) Trouble shooting in pressure measurement. (6 marks)

    (b) Manometers. (6 marks)

19. Write a detailed note on fibre optic temperature measurement system.

Or

20. Write notes on :

    (a) Expansion thermometer. (6 marks)

    (b) Temperature scales. (6 marks)

[5 × 12 = 60 marks]

G 1793 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

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.*
Each question carries 3 *marks.*

1. State any three types of stepper motor.
2. State the working principle of switched reluctance motor.
3. State the working principle of permanent magnet synchronous motor.
4. Compare brushless DC motor with conventional DC motor (any 3 points).
5. Compare switched reluctance synchronous reluctance motor (any 3 points).

(5 × 3 = 15 marks)

Part B

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

6. State the advantages and disadvantages of switched reluctance motor.
7. Explain electronic commutation process in case of BLDC motor.
8. With suitable diagrams explain working of axial and radial airgap motor.
9. Compare variable reluctance stepper motor with permanent magnet stepper motor, (any 5 points).
10. Draw and explain dynamic characteristics stepper motor.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. With suitable diagram explain 4 phase permanent magnet stepper motor. Draw its circuit diagram and explain its step operation.

Or

12. With suitable diagram explain operation of variable reluctance stepper motor. State its advantages.

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

Or

14. Draw a Circuit of closed loop control in switched reluctance motor. State applications of this motor.

15. Explain torque-speed characteristics of synchronous reluctance motor . Derive the torque equation of this motor.

Or

16. With suitable diagrams explain the speed control methods for synchronous reluctance motor.

17. For a square wave permanent magnet brushless dc motor, derive the torque equation with usual notations.

Or

18. Explain the operation of 6 step switching of star connected permanent magnet brushless dc motor with hall effect sensors.

19. With suitable diagrams explain the operation of permanent magnet synchronous motor.

Or

20. Draw and explain the torque-speed characteristics of permanent magnet synchronous motor. Sate its advantages and disadvantages. State any two applications of this motor

(5 × 12 = 60 marks)