(c) Explain the principle of operation of a capacitor start single phase motor. Draw its slip-torque characteristics. 55

7. (a) Draw the internal diagram of directional over current relay. Explain its operation.

(b) Write sequence of steps involved in load flow computation using Gauss–Seidel method.

(c) A transmission line conductor having a diameter of 19.5 mm weighs 0.85 kg/m. The wind pressure is 39 kg/sqm of projected area with ice coating of 13 mm. The ultimate strength of the conductor is 8000 kg. Calculate the maximum sag if the factor of safety is 2 and ice weighs 910 kg/cubic m. 55

SECTION–C

8. Answer any **three** :

(a) Discuss various signal modulation techniques employed in communication systems. Give their uses.

(b) State and explain Sampling Theorem. What is its significance in communication systems ?

(c) Write short notes on :

(i) Direct coupled amplifiers (ii) Difference amplifiers.

(d) What are different microwave measuring techniques ? Explain. 55

9. (a) A rectangular wave guide of dimensions 1 cm × 2.3 cm is excited in dominant mode at 9.375 GHz. Calculate the breakdown power.

(b) Write a brief note on the design of low pass filter for microwave circuits. 55

10. (a) Define the following terms :

(i) VSWR (ii) S/N ratio (iii) Voltage reflection coefficient.

(b) Discuss various communication techniques used for radio signal transmission.

(c) Discuss the role of modulators and demodulators in signal communications. 55

1[CCE.M]1

Electrical Engineering–II
(09)

Time : Three Hours　　　　　　　　Maximum Marks : 300

INSTRUCTIONS

(i) Answers must be written in English.

(ii) The number of marks carried by each question is indicated at the end of the question.

(iii) The answer to each question or part thereof should begin on a fresh page.

(iv) Your answers should be precise and coherent.

(v) The part/parts of the same question must be answered together and should not be interposed between answers to other questions.

(vi) Candidates should attempt section A and B or A and C. Question No. **1** is compulsory. Candidates are required to attempt **one** more question from section A and any **three** more from section B or C.

(vii) If you encounter any typographical error, please read it as it appears in the text book.

(viii) Candidates are in their own interest advised to go through the General Instructions on the back side of the title page of the Answer Script for strict adherence.

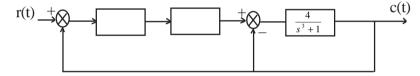(ix) No continuation sheets shall be provided to any candidate under any circumstances.

(x) Candidates shall put a cross (X) on blank pages of Answer Script.

(xi) No blank page be left in between answer to various questions.

SECTION–A

1. Answer any **three** :

(a) Derive the transfer function of dc motor with armature voltage control when its field is separately excited.

(b) State Masons Gain formula. Explain how transfer function can be determined with above formula with the help of an example.

(c) Describe the operation of single phase fully controlled rectifier with R-L load.

(d) Draw the circuit of single phase bridge inverter. Explain its principle with the help of a waveform. 80

2. (a) Obtain the total transfer function of the following system :

$\dfrac{3}{s^2+2}$

r(t) $+$⊗ → ▭ → ▭ → $+$⊗ $-$ → $\dfrac{4}{s^3+1}$ → c(t)

(b) Determine the steady state error for a system with transfer function when unit step input is given :

$$G(s) = \frac{2}{(s+1)(s+5)}.$$

(c) Given the defining equations of a system, determine the transfer function : x(s)/y(s)

$$2\frac{d^2x}{dt^2} + 3\frac{dx}{dt} + 4 = 5y(t).$$ 55

3. (a) Explain Nyquist Stability criterion for determining stability of linear system.

(b) Write the sequence of steps involved in determining stability of the system with Routh's stability criterion.

(c) Discuss various compensation methods in control system design. 55

SECTION–B

4. Answer any **three** :

(a) Draw the torque characteristics of 3-phase induction motor. What is the effect of variation of rotor circuit resistance on torque-slip characteristics ?

(b) Explain star-delta starting of 3-phase induction motor.

(c) Discuss various methods of starting a synchronous motor.

(d) Describe how voltage grading is done in string type of insulators. 55

5. (a) Derive an expression for synchronising power of synchronous generator.

(b) A 6-pole, 3-phase, 50 Hz, synchronous motor is supplied from 6.6 kV, busbars. Its open circuit emf is 3.3 kV/phase. The impedance of machine is (0.6 + j4.8) ohms per phase. Calculate current, power factor, and torque developed when excitation emf lags the voltage by (i) 15 deg (ii) 25 deg.

(c) Write a short note on experimental method to determine positive sequence, negative sequence, and zero sequence impedances of synchronous machine. 55

6. (a) Derive an equation for the developed torque of 3-phase induction motor from in terms of its parameters of equivalent circuit.

(b) The results on no load and blocked rotor tests on 5hp, 3-phase, 400 V, delta connected Squirrel cage induction motor are given below :

No load test : 400 V, 3.2 A, 350 W

Blocked rotor tests : 86 V, 15 A, 600 W

Its stator resistance is 1.2 ohm per phase. Determine the parameters of equivalent circuit.