

MIZORAM PUBLIC SERVICE COMMISSION

GENERAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF JUNIOR GRADE OF MIZORAM FOREST SERVICE i.e. ASSISTANT CONSERVATION OF FOREST (ACF) UNDER ENVIRONMENT, FOREST & CLIMATE CHANGE DEPARTMENT, GOVERNMENT OF MIZORAM, 2018

ELECTRONICS ENGINEERING

Time Allowed : 3 hours

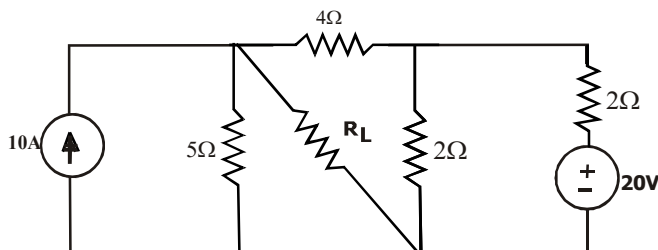
Full Marks : 100

The figures in the margin indicate full marks for the questions.

Answer any 10 (ten) questions taking 5 (five) questions from each section.

SECTION - A

- Briefly explain the different types of magnetic materials. (5)
 - With the help of band diagram distinguish between insulator, semiconductor and metal. (5)
- Explain in brief the operation of an Enhancement type and Depletion type MOSFET. (6)
 - Explain briefly the following (2×2=4)
 - Transducer
 - Ferrites
- Determine the Laplace transform of $x(t) = e^{-at} \text{Cos } \Omega_0 t u(t)$. (4)
 - Perform convolution of the following causal signals given as (6)
 - $x_1(t) = \text{Cos } t u(t)$, $x_2(t) = t u(t)$
 - $x_1(t) = 2u(t)$, $x_2(t) = u(t)$
- What are ceramics? What are the types of ceramics? (3)
 - What are the piezoelectric materials? List two applications of piezoelectric materials. (2)
 - What are superconductors? Show that perfect diamagnetism and zero resistivity are two independent properties of the superconducting state. (5)
- Find the current through $R_L = 7.5\Omega$ using Superposition Theorem in the following circuit (6)



(b) For a two-port network explain open-circuit impedance parameters. Also draw an equivalent circuit diagram for that. (4)

6. (a) The electric field component of an electromagnetic wave propagating through a medium (characterized by $\epsilon=2\epsilon_0$, $\mu=8\mu_0$ and $\sigma = 0.05 \text{ S/m}$) is given by

$$\vec{E}(z,t) = 10e^{-\alpha z} \cos(2\pi \times 50 \times 10^6 t - \beta z) \hat{x} \text{ V/m. Compute}$$

(i) Propagation constant (γ)

(ii) Attenuation constant (α)

(iii) Phase constant (β) (6)

(b) Deduce the relationship between electric flux density (\vec{D}) and electric field intensity (\vec{E}). (4)

7. (a) What are the typical physical characteristics that give an edge to the capacitance transducers over resistive and inductive transducers? (4)

(b) Write short notes on (any two) (2×3=6)

(i) Divergence theorem

(ii) GTOs

(iii) CMOS

SECTION - B

8. (a) With a circuit, explain the operation of Colpitt's Oscillator. (5)

(b) An amplifier with open loop voltage gain $A_0 = 1000 \pm 100$ is available. It is required to have an amplifier whose voltage gain varies by no more than $\pm 0.1\%$. (5)

(i) Find the value of the feedback factor required.

(ii) Find the gain with feedback.

9. (a) Define fan out. What factor is responsible for the limit of fan out in TTL circuits? (4)

(b) Minimize the following logic function using Karnaugh map and realize the same using logic gates

$$f(A, B, C, D) = \sum m(0, 2, 3, 10, 11, 12, 13, 16, 17, 18, 19, 20, 21, 26, 27). \quad (6)$$

10. (a) Draw a neat block schematic to show the functional blocks of successive approximation A/D converter. Explain its operation using timing diagrams. (6)

(b) Convert a SR Flip-flop into JK flip-flop. (4)

11. (a) What is S parameter? Describe the properties of S parameter. (3)

(b) The open-loop transfer function of a unity feedback control system is

$$G(s) = \frac{k(s+5)(s+40)}{s^3(s+200)(s+1000)}. \text{ Construct the root-locus diagram of the system.} \quad (7)$$

12. (a) State sampling theorem. Explain “flat-top sampling”. (4)
(b) A fiber optic system is having a refractive index of glass 1.5 and 1.51 for cladding. Calculate (4)
(i) Numerical aperture
(ii) Maximum acceptance angle.
(c) Differentiate between satellite system and terrestrial wireless system. (2)
13. (a) Explain the operation of IMPATT diode. What are the disadvantages and applications of IMPATT diode? (6)
(b) Calculate the unfaded C/N ratio of microwave link of IF bandwidth 20 MHz, 35km long. Output of transmitter is 750 mW at 6.1 GHz and receiver noise figure is 9 dB. Antenna gain on each side are 30dB and transmission line loss is 2.1dB. gaseous atmospheric loss is 0.3dB. (4)
14. (a) Explain what happens in an 8085 microprocessor based system when the microprocessor receives HOLD signal. (3)
(b) Explain SIM and RIM instruction of 8085 microprocessor. (3)
(c) Define Stack. Explain the use of stack and a stack pointer. (4)

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