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OMR Sheet No. : .....
(To be filled by the Candidate)

Roll No. | | | | | | | |
(In figures as per admission card)

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**J 8 8 1 0**

**Test Booklet No.**

Time : **1 1/4** hours]

# PAPER-II
# ELECTRONIC SCIENCE

[Maximum Marks : **100**

Number of Pages in this Booklet : **8**

Number of Questions in this Booklet : **50**

## Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of fifty multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
   (iii) After this verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the oval as indicated below on the correct response against each item.
   **Example :** (A) (B) ● (D)
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **Answer Sheet given inside the Paper I Booklet only.** If you mark at any place other than in the ovals in the Answer Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the test booklet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. You have to return the test question booklet and OMR Answer sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

## परीक्षार्थियों के लिए निर्देश

1. पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए ।
2. इस प्रश्न-पत्र में पचास बहुविकल्पीय प्रश्न हैं ।
3. परीक्षा प्रारम्भ होने पर, प्रश्न-पुस्तिका आपको दे दी जायेगी । पहले पाँच मिनट आपको प्रश्न-पुस्तिका खोलने तथा उसकी निम्नलिखित जाँच के लिए दिये जायेंगे जिसकी जाँच आपको अवश्य करनी है :
   (i) प्रश्न-पुस्तिका खोलने के लिए उसके कवर पेज पर लगी कागज की सील को फाड़ लें । खुली हुई या बिना स्टीकर-सील की पुस्तिका स्वीकार न करें ।
   (ii) **कवर पृष्ठ पर छपे निर्देशानुसार प्रश्न-पुस्तिका के पृष्ठ तथा प्रश्नों की संख्या को अच्छी तरह चैक कर लें कि ये पूरे हैं । दोषपूर्ण पुस्तिका जिनमें पृष्ठ/प्रश्न कम हों या दुबारा आ गये हों या सीरियल में न हों अर्थात किसी भी प्रकार की त्रुटिपूर्ण पुस्तिका स्वीकार न करें तथा उसी समय उसे लौटाकर उसके स्थान पर दूसरी सही प्रश्न-पुस्तिका ले लें । इसके लिए आपको पाँच मिनट दिये जायेंगे । उसके बाद न तो आपकी प्रश्न-पुस्तिका वापस ली जायेगी और न ही आपको अतिरिक्त समय दिया जायेगा ।**
   (iii) इस जाँच के बाद प्रश्न-पुस्तिका की क्रम संख्या OMR पत्रक पर अंकित करें और OMR पत्रक की क्रम संख्या इस प्रश्न-पुस्तिका पर अंकित कर दें ।
4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (A), (B), (C) तथा (D) दिये गये हैं । आपको सही उत्तर के दीर्घवृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है ।
   **उदाहरण :** (A) (B) ● (D)
   जबकि (C) सही उत्तर है ।
5. प्रश्नों के उत्तर **केवल प्रश्न पत्र I के अन्दर दिये गये उत्तर-पत्रक पर ही** अंकित करने हैं । यदि आप उत्तर पत्रक पर दिये गये दीर्घवृत्त के अलावा किसी अन्य स्थान पर उत्तर चिह्नांकित करते हैं, तो उसका मूल्यांकन नहीं होगा ।
6. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें ।
7. कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें ।
8. यदि आप उत्तर-पुस्तिका पर अपना नाम या ऐसा कोई भी निशान जिससे आपकी पहचान हो सके, किसी भी भाग पर दर्शाते या अंकित करते हैं तो परीक्षा के लिये अयोग्य घोषित कर दिये जायेंगे ।
9. आपको परीक्षा समाप्त होने पर प्रश्न-पुस्तिका एवं OMR उत्तर-पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें ।
10. **केवल नीले/काले बाल प्वाईंट पैन का ही इस्तेमाल करें ।**
11. **किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है ।**
12. **गलत उत्तरों के लिए कोई अंक काटे नहीं जाएँगे ।**

## ELECTRONIC SCIENCE
## Paper – II

**Note :** This paper contains **fifty (50)** objective type questions, each question carrying **two (2)** marks. Attempt **all** the questions.

**1.** In a degenerate n-type semiconductor the fermilevel lies
(A) within the conduction band
(B) below the conduction band
(C) within the valance band
(D) above the valance band

**2.** The threshold voltage of enhancement mode MOSFET can be adjusted by adjusting the
(A) channel doping
(B) channel length
(C) source doping
(D) drain doping

**3.** The Laplace transform $e^{-at}$ is
(A) $\frac{1}{s+a}$ (B) $\frac{1}{s-a}$
(C) $(s+a)$ (D) $(s-a)$

**4.** Norton theorem deals with the equivalent
(A) voltage source
(B) power source
(C) current source
(D) light source

**5.** In a PLL, lock occurs when the
(A) input frequency and the VCO frequency are the same
(B) phase error is 180°
(C) VCO frequency is double the input frequency
(D) phase error is 90°

**6.** CMRR (Common Mode Rejection Ratio) for a differential amplifier should be
(A) zero (B) unity
(C) small (D) large

**7.** Sequential circuits are essentially
(A) Asynchronous circuits
(B) Astable multivibrators
(C) Schmitt trigger
(D) Synchronous circuits

**8.** Multiplexers are also used to realize
(A) Input function to amplifier
(B) Boolean function
(C) Up-down counter
(D) Memories

**9.** Which instruction of 8086 will <u>not</u> execute ?
(A) MOV DS, 1234 H
(B) MOV SP, 1234 H
(C) MOV AX, 1234 H
(D) MOV SI, 1234 H

**10.** The HL pair of 8085 microprocessor is loaded with 0505 H. The HL pair is decremented to 000H. Which flag will be affected ?
(A) Z flag
(B) C flag
(C) No flag is affected
(D) P flag

**11.** What places limit on the largest and the smallest integer values in a program ?
(A) Language used
(B) Compiler
(C) CPU
(D) Size of the operator

**12.** Which is <u>not</u> an infinite loop ?
(A) for (; ;)
(B) while (1)
(C) loop; $x = x - -$; go to loop;
(D) while (0)

**13.** The complex poynting vector can be defined as
(A) $\frac{1}{2}(\vec{E} \times \vec{H}^*)$ (B) $\frac{1}{2}(\vec{E} \times \vec{H})$
(C) $(\vec{E}^* \times \vec{H})$ (D) $(E \times H^*)$

**14.** The intrinsic impedance of free space can be defined by
(A) $\sqrt{\frac{\mu_0}{\epsilon_0}}$ (B) $\frac{\mu_0}{\sqrt{\epsilon_0}}$
(C) $\frac{\sqrt{\mu_0}}{\epsilon_0}$ (D) $\frac{\mu_0}{\epsilon_0}$

**15.** The value of numerical aperture in fiber optic communication system is equal to

(A) zero (B) $> 1$

(C) $< 1$ (D) 1

**16.** Which of the following produces amplitude and phase modulation both ?

(A) PSK (B) QPSK

(C) FSK (D) QAM

**17.** Which of the following transducer has the largest linearity ?

(A) RTD

(B) Thermistor

(C) IC sensor

(D) Thermo couple

**18.** In negative feed back control system, the output amplitude is _____ than in open loop control system.

(A) always reduced

(B) always increased

(C) never reduced

(D) never increased

**19.** Which of the following physical parameter can be measured by LVDT ?

(A) Displacement

(B) Velocity

(C) Acceleration

(D) Pressure

**20.** The transfer function of a control system is applicable to which of the following ?

(A) Linear and time-invariant systems

(B) Linear and time-variant systems

(C) Non-linear and time-variant systems

(D) Non-linear and time-invariant systems

**Directions :** Q. Nos. **21** to **30 :** The following items consist of two statements, one labelled the "Assertion (A)" and the other labelled the "Reason (R)". You are to examine these two statements carefully and decide if the Assertion (A) and the Reason (R) are individually true and if so, whether the Reason is a correct explanation of the Assertion. Select your answers to these items using the codes given below and mark your answer accordingly.

**Codes :**

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are true, but (R) is not correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

**21.** **Assertion (A) :** JFET is used in automatic gain control circuits.

**Reason (R) :** Its variable voltage register property helps gain control.

**22.** **Assertion (A) :** Superposition theorem can be used to determine the output of a full-wave rectifier whose inputs are sinusoidal signal sources of different frequencies connected in series.

**Reason (R) :** Superposition theorem holds good for all linear systems.

**23.** **Assertion (A) :** Operational amplifiers have a high slew rate for good transient response.

**Reason (R) :** Slew rate is the maximum rate of change of the output voltage of the operational amplifier when a large amplitude step is applied to its input.

**24.** **Assertion (A) :** NAND gate is a universal building block.
**Reason (R) :** De Morgan's theorem provides inter conversion of gates.

**25.** **Assertion (A) :** 8051 is a Boolean processor.
**Reason (R) :** There are no bit manipulation instructions in 8051.

**26.** **Assertion (A) :** 'C' statement is; int value = 55.
**Reason (R) :** The value 55 is assigned to variable value.

**27.** **Assertion (A) :** Radio and television receivers are generally of the superheterodyne type.
**Reason (R) :** Wireless communication is possible by receiving signals through super heterodype receivers.

**28.** **Assertion (A) :** IR lasers are used for long haul transmission operating around at 193 THz.
**Reason (R) :** The line width of the semiconductor lasers are of the order of fraction of nm.

**29.** **Assertion (A) :** Thyristors are preferred to power diodes in variable power rectifiers.
**Reason (R) :** Thyristors provide controlled rectification and also the power loss in them is less compared to that in power diodes.

**30.** **Assertion (A) :** The transient performance of a feedback control system is normally analysed by using a unit-step function as the reference input.
**Reason (R) :** Unit step function is the most common input found in practice.

**31.** What is the correct sequence of the following step in the fabrication step of a monolithic, bipolar junction transistor ?
1. Emitter diffusion
2. Base diffusion
3. Buried layer formation
4. Epi-layer formation

Select the correct sequence using the codes given below :
**Codes :**
(A) 3, 4, 1, 2 (B) 4, 3, 1, 2
(C) 3, 4, 2, 1 (D) 4, 3, 2, 1

**32.** The following logic families are written
1. TTL 2. DTL
3. CMOS 4. ECL

The order in which the propagation delay increases is
(A) 4, 1, 3, 2 (B) 4, 1, 2, 3
(C) 1, 2, 4, 3 (D) 3, 2, 4, 1

**33.** Given below is a list of transducers :
1. RTD
2. Thermocouple
3. IC sensor
4. Thermistor

The order in which the temperature range sensed increases
(A) 1, 2, 3, 4 (B) 4, 1, 3, 2
(C) 2, 4, 3, 1 (D) 3, 4, 1, 2

**34.** Following are the frequency bands :
1. e 2. *x*
3. k 4. ku

Arrange them in increasing frequency order :
(A) 2, 1, 3, 4 (B) 1, 3, 4, 2
(C) 1, 2, 3, 4 (D) 4, 2, 3, 1

**35.** For a closed loop system, the roots of the characteristic equation yields
1. Negative real repetitive roots in critically damped case.
2. Positive roots in negatively damped case and response diverges out.
3. Real negative roots in over damped case.
4. Sustained oscillations.

Select the correct sequence which takes the system from stable to unstable state, using the codes given below :
(A) 1, 3, 4, 2 (B) 2, 4, 3, 1
(C) 3, 2, 4, 1 (D) 4, 1, 3, 2

**Directions :** Q. Nos. **36** to **45 :**
In the following question, match List–I and List–II and select the correct answer using the codes given below the Lists.

**36.**

| | List – I | List – II |
|---|---|---|
| (a) | p-n junction diode | (i) Reference voltage |
| (b) | Zener diode | (ii) Pinch-off |
| (c) | MOSFET | (iii) Negative resistance |
| (d) | Tunnel diode | (iv) Diffusion |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (iv) | (i) | (ii) | (iii) |
| (B) | (i) | (ii) | (iii) | (iv) |
| (C) | (iii) | (iv) | (ii) | (i) |
| (D) | (iv) | (iii) | (i) | (ii) |

**37.**

| | List – I | List – II |
|---|---|---|
| (a) | Laplace | (i) Voltage sources |
| (b) | Poles on imaginary axis | (ii) Frequency response |
| (c) | Thevenin's Theorem | (iii) Oscillatory |
| (d) | Bode plots | (iv) Transient analysis |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (ii) | (iii) | (i) | (iv) |
| (B) | (iii) | (i) | (iv) | (ii) |
| (C) | (iv) | (iii) | (i) | (ii) |
| (D) | (i) | (iv) | (iii) | (ii) |

**38.**

| | List – I | List – II |
|---|---|---|
| (a) | Schmitt trigger | (i) Linear wave shaping |
| (b) | Clipping | (ii) Hysteresis |
| (c) | Op-amp | (iii) Barkhausen Criterion |
| (d) | Oscillators | (iv) Slew rate |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (i) | (iii) | (ii) | (iv) |
| (B) | (iii) | (ii) | (i) | (iv) |
| (C) | (ii) | (i) | (iv) | (iii) |
| (D) | (iv) | (ii) | (iii) | (i) |

**39.**

| | List – I | List – II |
|---|---|---|
| (a) | JK flip-flop | (i) Parallel output |
| (b) | Serial in parallel out | (ii) Octate |
| (c) | Combination logic | (iii) Race around |
| (d) | k-map | (iv) Flip-flop |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (iv) | (iii) | (i) | (ii) |
| (B) | (iii) | (i) | (iv) | (ii) |
| (C) | (i) | (ii) | (iv) | (iii) |
| (D) | (ii) | (iv) | (i) | (iii) |

**40.**

| | List – I | List – II |
|---|---|---|
| (a) | 8086 | (i) Timer |
| (b) | 8051 | (ii) 6-byte Que |
| (c) | 8155 | (iii) Accumulator clear |
| (d) | Zero flag | (iv) 4–I/O ports |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (ii) | (iv) | (i) | (iii) |
| (B) | (i) | (ii) | (iv) | (iii) |
| (C) | (iii) | (i) | (ii) | (iv) |
| (D) | (iv) | (iii) | (i) | (ii) |

**41.**

| | List – I | List – II |
|---|---|---|
| (a) | main ( ) | (i) Object oriented programming |
| (b) | return (*x*, y) | (ii) Syntax error |
| (c) | C++ | (iii) Program execution start |
| (d) | print ("my name"); | (iv) Invalid statement |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (i) | (ii) | (iv) | (iii) |
| (B) | (iv) | (i) | (ii) | (iii) |
| (C) | (iii) | (iv) | (i) | (ii) |
| (D) | (ii) | (i) | (iv) | (iii) |

**42.**

| | List – I | List – II |
|---|---|---|
| (a) | SCR | (i) bilateral |
| (b) | UJT | (ii) dc to ac |
| (c) | Triac | (iii) intrinsic stand off ratio |
| (d) | Inverter | (iv) holding current |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (i) | (iv) | (ii) | (iii) |
| (B) | (ii) | (i) | (iii) | (iv) |
| (C) | (iii) | (ii) | (iv) | (i) |
| (D) | (iv) | (iii) | (i) | (ii) |

**43.**

| List – I | List – II |
|---|---|
| (a) Single Mode Fiber | (i) Population inversion |
| (b) DWDM | (ii) Isolator |
| (c) Optocoupler | (iii) 0.1 nm |
| (d) LASER | (iv) V < 2.405 |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (iv) | (iii) | (ii) | (i) |
| (B) | (iii) | (iv) | (ii) | (i) |
| (C) | (iii) | (ii) | (iv) | (i) |
| (D) | (i) | (ii) | (iii) | (iv) |

**44.**

| List – I | List – II |
|---|---|
| (a) $\nabla^2 V = 0$ | (i) Gauss's law |
| (b) $\nabla^2 V = -\frac{\rho}{\in}$ | (ii) Laplace equation |
| (c) $\nabla . \vec{D} = \rho_v$ | (iii) Poisson's equation |
| (d) $\nabla . \vec{J} = -\rho_v$ | (iv) Equation of continuity |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (ii) | (iii) | (i) | (iv) |
| (B) | (i) | (ii) | (iii) | (iv) |
| (C) | (iv) | (iii) | (i) | (ii) |
| (D) | (iv) | (ii) | (i) | (iii) |

**45.**

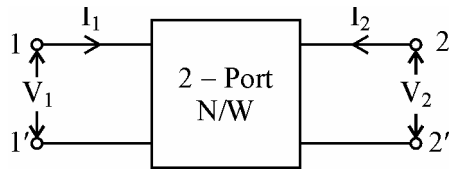
| List – I | List – II |
|---|---|
| (a) Single Mode Fiber | (i) detector |
| (b) Polarized Mode Dispersion | (ii) transmitter |
| (c) Photo diode | (iii) Ps/$\sqrt{km}$ |
| (d) LED | (iv) 0.2 dB/km |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (iii) | (i) | (iv) | (ii) |
| (B) | (iv) | (iii) | (i) | (ii) |
| (C) | (iv) | (i) | (ii) | (iii) |
| (D) | (i) | (ii) | (iii) | (iv) |

Read the paragraph and answer the questions **46** to **50**.

Two-port networks : A two port network consists of one input port (1-1′) and one output port (2-2′). The port variables are currents and voltages. Any external network connected either at the input or at the output port is called termination. The number of equations to describe relationship amongst the port voltages and currents for an n-port network will be n with 2n variables.




For a two-port network the four variables are $V_1$, $I_1$ at the input port and $V_2$,$I_2$ at the output port. Only two out of these four variables are independent.

Study of two-port network is important in synthesizing and designing networks like filters, matching networks, wave shaping networks transmission lines and many more.

The two port parameters include

1. Open circuit impedance Z-parameters.
2. Short circuit admittance Y-parameters.
3. Transmission or Chain ABCD parameters.
4. Inverse transmission A' B' C' D' parameters.
5. Hybrid i.e. h-parameters and
6. Inverse hybrid g-parameters.

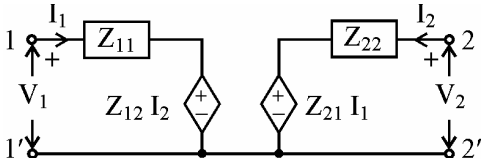
The Z-parameters evaluated from the equations.

$$V_1 = Z_{11} I_1 + Z_{12} I_2$$

$$V_2 = Z_{21} I_1 + Z_{22} I_2$$

Furnish information about input driving point impedance ($Z_{11}$), forward transfer impedance with output port open ($Z_{12}$) and reverse transfer impedance with input open circulated ($Z_{22}$)

The equations for Z-parameters lead to equivalent circuit are as follows :



A network becomes reciprocal when $Z_{12} = Z_{21}$ and symmetrical when $Z_{11} = Z_{22}$.

Z, Y, h and transmission parameters are related to each other. Relation of Z and h parameters is of the following type :

$$\begin{bmatrix} Z_{11} & Z_{12} \\ Z_{21} & Z_{22} \end{bmatrix} = \begin{bmatrix} \frac{\Delta h}{h_{22}} & \frac{h_{12}}{h_{22}} \\ -\frac{h_{11}}{h_{22}} & \frac{1}{h_{22}} \end{bmatrix}$$

$$\Delta h = h_{11}h_{22} - h_{12}h_{21}$$

and

$$\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} = \begin{bmatrix} \frac{\Delta Z}{Z_{22}} & \frac{Z_{12}}{Z_{22}} \\ -\frac{Z_{21}}{Z_{22}} & \frac{1}{Z_{22}} \end{bmatrix}$$

$$\Delta Z = Z_{11}Z_{22} - Z_{12}Z_{21}$$

A given two-port network can be built using simple two-port networks and interconnecting them. A two port network can be designed by combining simple two port structures as building blocks.

The two port networks can be connected in series or in parallel or in series-parallel. The open circuit impedance parameter representation for example is useful in characterizing series connected two-port networks. The overall Z-parameter matrix for series connected two-port networks is the sum of the Z-matrices of each individual two-port networks connected in series. The short circuit impedance parameter representation helps in characterizing parallel-connected two-port network. Using such connections other parameter representations are possible.

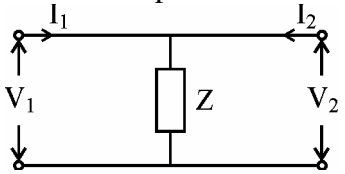
**46.** Which parameters are useful to construct a model for transistor ?
(A) Z (B) Y
(C) h (D) g

**47.** h-parameter representation is the dual of _____ parameter representation
(A) ABCD (B) g
(C) Y (D) Z

**48.** For a two port network the Z-parameters are
$Z_{11} = 6\Omega$, $Z_{22} = 6\Omega$, $Z_{21} = 2\Omega$ and $Z_{12} = 2\Omega$
$h_{12}$ is _____
(A) 6 Ω (B) 2 Ω
(C) 3 Ω (D) 113 Ω

**49.** Z and Y-parameters are related. If Z parameters are known Y-parameters can be evaluated. Why Z and Y parameters are separately defined ?
(A) for academic reason
(B) Y-parameters are difficult to evaluate.
(C) Z-parameters cannot be evaluated at high frequency due to open circuit condition.
(D) Y parameters cannot be evaluated from Z parameters and vice-a-versa.

**50.** For a two port-network given below what are its Z-parameters ?




(A) $\begin{bmatrix} Z & 0 \\ 0 & Z \end{bmatrix}$ (B) $\begin{bmatrix} 0 & Z \\ Z & 0 \end{bmatrix}$
(C) $\begin{bmatrix} Z & Z \\ Z & 0 \end{bmatrix}$ (D) $\begin{bmatrix} Z & Z \\ Z & Z \end{bmatrix}$