

PAPER-II ELECTRONIC SCIENCE

Signature and Name of Invigilator

1. (Signature) _____

(Name) _____

2. (Signature) _____

(Name) _____

J 8 8 1 2

Time : 1 ¼ hours]

OMR Sheet No. :

(To be filled by the Candidate)

Roll No.

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(In figures as per admission card)

Roll No. _____

(In words)

[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 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 circle as indicated below on the correct response against each item.
Example : (A) (B) (C) (D)
where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Paper I Booklet only**. If you mark at any place other than in the circle in the OMR 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, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
9. You have to return the test question booklet and Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry duplicate copy of OMR Sheet on conclusion of examination.
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

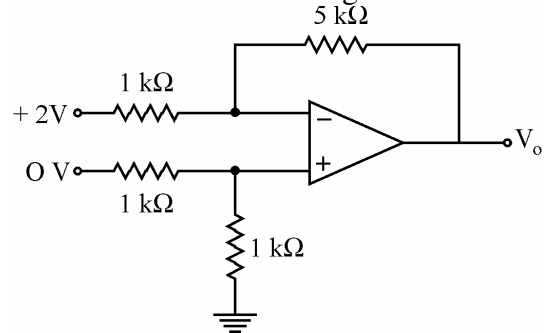
1. पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए ।
2. इस प्रश्न-पत्र में पचास बहुविकल्पीय प्रश्न हैं ।
3. परीक्षा प्रारम्भ होने पर, प्रश्न-पुस्तिका आपको दे दी जायेगी । पहले पाँच मिनट आपको प्रश्न-पुस्तिका खोलने तथा उसकी निम्नलिखित जाँच के लिए दिये जायेंगे, जिसकी जाँच आपको अवश्य करनी है :
 - (i) 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 चेक कर लें कि ये पूरे हैं । दोषपूर्ण पुस्तिका जिनमें पृष्ठ/प्रश्न कम हों या दुबारा आ गये हों या सीरियल में न हों अर्थात् 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 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 वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है ।
उदाहरण : (A) (B) (C) (D)
जबकि (C) सही उत्तर है ।
5. प्रश्नों के उत्तर केवल प्रश्न पत्र I के अन्दर दिये गये OMR पत्रक पर ही अंकित करने हैं । यदि आप OMR पत्रक पर दिये गये वृत्त 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 OMR पत्रक पर नियत स्थान के अलावा अपना नाम, रोल नम्बर, फोन नम्बर या कोई भी ऐसा चिह्न जिससे आपकी पहचान हो सके, अंकित करते हैं अथवा अभद्र भाषा का प्रयोग करते हैं, या कोई अन्य अनुचित साधन का प्रयोग करते हैं, तो परीक्षा के लिये अयोग्य घोषित किये जा सकते हैं ।
9. आपको परीक्षा समाप्त होने पर प्रश्न-पुस्तिका एवं मूल OMR पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें । हालांकि आप परीक्षा समाप्ति पर OMR पत्रक की डुप्लीकेट प्रति अपने साथ ले जा सकते हैं ।
10. केवल नीले/काले बाल प्वाइंट पेन 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 JFET the change in drain current is due to the applied
 - (A) Electric field between S and D
 - (B) Electric field between G and S
 - (C) Magnetic field between S and D
 - (D) Magnetic field between G and S
2. The increase in temperature, the electrical conductivity would
 - (A) increase in metals as well as increase in semiconductors
 - (B) increase in metals but decrease in semiconductors
 - (C) decrease in metals but increase in semiconductors
 - (D) decrease in metals as well as in semiconductors
3. A network contains only independent current sources and resistors. If values of all resistors are doubled, then values of node voltages
 - (A) will become half
 - (B) will remain unchanged
 - (C) will become double
 - (D) cannot be determined unless circuit configuration and values of the resistors are known
4. Thevenin's theorem replaces a complicated circuit facing a load by an
 - (A) ideal voltage source and parallel resistor
 - (B) ideal current source and parallel resistor
 - (C) ideal current source and series resistor
 - (D) ideal voltage source and series resistor
5. When Op-Amp is used as an integrator, the feedback element is
 - (A) Resistor
 - (B) Capacitor
 - (C) Zener diode
 - (D) Voltage divider

6. The output V_o of the ideal Op-Amp circuit shown in the figure is



- (A) -10 V
 - (B) -5 V
 - (C) 5 V
 - (D) 10 V
7. How many Flip-Flops are required to build a binary counter circuit to count from 0 to 1023 ?
 - (A) 1
 - (B) 6
 - (C) 10
 - (D) 24
8. Among the following, the slowest ADC (Analog-to-digital converter) is
 - (A) Parallel-comparator (i.e.) flash type
 - (B) Successive approximation type
 - (C) Integrating type
 - (D) Counting type
9. In a microcomputer, WAIT states are used to
 - (A) make the processor wait during a DMA operation
 - (B) make the processor wait during a power interrupt processing
 - (C) make the processor wait during a power shut down
 - (D) interface slow peripherals to the processor
10. In a microprocessor, the register which holds the address of the next instruction to be fetched is
 - (A) Accumulator
 - (B) Program Counter
 - (C) Stack Pointer
 - (D) Instruction Register

11. Consider the following structure and declaration :
- ```

1. struct date {
2. int day;
3. int month;
4. int year;
5. };
Struct data *pd ;

```
- Which of the following is the correct method to refer to the year member ?
- (A) (\*pd).year (B) (\*pd)\*year  
(C) (\*pd)→year (D) pd→year
12. Which of the following is not a linear data structure ?
- (A) Array (B) Linked list  
(C) Stack (D) Tree
13.  $\nabla^2 V = -\frac{\rho}{\epsilon}$  represents
- (A) Maxwell's equation  
(B) Laplace's equation  
(C) Poisson's equation  
(D) Gauss's law
14. The energy per unit time, per unit area transported by the electromagnetic fields is expressed as
- (A)  $\vec{S} = \frac{1}{\mu_0} (\vec{E} \times \vec{B})$   
(B)  $\vec{S} = (\vec{E} \times \vec{B})$   
(C)  $\vec{S} = \mu_0 (\vec{E} \times \vec{B})$   
(D)  $\vec{S} = \frac{1}{\epsilon_0} (\vec{E} \times \vec{B})$
15. Time-Division Multiplexing
- (A) can be used with PAM only.  
(B) combines five groups into a supergroup.  
(C) stacks 24 channels in adjacent frequency slots.  
(D) interleaves pulses belonging to different transmissions.
16. One of the following types of noise becomes of great importance at high frequencies. It is the
- (A) Shot noise  
(B) Random noise  
(C) Impulse noise  
(D) Transit-time noise

17. A relaxation oscillator is one which
- (A) oscillates continuously  
(B) has two stable states  
(C) relax indefinitely  
(D) produces non-sinusoidal output
18. The transducer which generates electrical power
- (A) Photoconductor  
(B) Photodiode  
(C) Solar cell  
(D) Phototransistor
19. The step-index monomode fiber has diameter
- (A)  $\leq 10 \mu\text{m}$  (B)  $50 \mu\text{m}$   
(C)  $100 \mu\text{m}$  (D)  $200 \mu\text{m}$
20. Which control system has hysteresis property ?
- (A) ON-OFF controller  
(B) Proportional controller  
(C) Integral controller  
(D) P-I-D controller

**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) :** If a semiconductor is placed in a transverse magnetic field B and an electric field E is applied across its other two faces, then it would produce an electric current I, in the direction perpendicular to both B and E.
- Reason (R) :** Hall co-efficient is proportional to the mobility of charge carrier in semi-conductor.

22. **Assertion (A)** : The voltage-current characteristic of tunnel diode exhibits dynamic negative resistance region.  
**Reason (R)** : The negative resistance occurs, therefore, tunnel diode behaves as low power oscillating device.
23. **Assertion (A)** : R-2R ladder type D/A converter has a higher speed of conversion than a weighted resistance D/A converter.  
**Reason (R)** : R-2R ladder type D/A converter uses a smaller number of components than the weighted resistance D/A converter.
24. **Assertion (A)** : A processor can reference a memory stack without specifying an address.  
**Reason (R)** : The address is always available and automatically updated in the stack pointer.
25. **Assertion (A)** : The part of root locus on the real axis is not dependent upon the poles and zeros which are not on the real axis.  
**Reason (R)** : Poles and zeros which are not on the real axis always occur in conjugate pairs.
26. **Assertion (A)** : The top down structured programming should be used for developing programmes.  
**Reason (R)** : The top down structured programming methodology enables us to get readable and easily provable program.
27. **Assertion (A)** : Stimulated emission is the key to the operation of LASER.  
**Reason (R)** : An important property of laser radiation is its coherence, under which is meant the correlation between the phases of oscillation at different positions in space and at various moments of time.

28. **Assertion (A)** : An half adder is faster than full-adder.  
**Reason (R)** : An half adder gives only one output while a full adder gives two outputs.
29. **Assertion (A)** : A programmable Read-Only-Memory can be used as a synchronous counter.  
**Reason (R)** : Each memory location of a programmable Read-Only-Memory is programmed and can be read synchronously.
30. **Assertion (A)** : In PCM a message signal is represented by a sequence of coded pulses, which is accomplished by representing the signal in discrete form in both time and amplitude.  
**Reason (R)** : The signal encoded in the form of quantized samples which translates into a coded number.
31. Consider the following circuit configurations :  
 1. Common emitter  
 2. Common base  
 3. Emitter follower  
 4. Emitter follower using Dartington pair  
 The correct sequence in increasing order of the input resistances of these configurations is  
 (A) 2, 1, 4, 3 (B) 1, 2, 4, 3  
 (C) 2, 1, 3, 4 (D) 1, 2, 3, 4
32. Digital measuring instruments use the following types of A to D converters :  
 1. Dual slope Type  
 2. Counter Type  
 3. Flash Type  
 The correct sequence for these converters in decreasing order of their speed (fastest to slowest) is  
 (A) 3, 1, 2 (B) 1, 2, 3  
 (C) 2, 3, 1 (D) 3, 2, 1

33. Consider the following logic families :

- |        |        |
|--------|--------|
| 1. MOS | 2. DTL |
| 3. RTL | 4. ECL |

The sequence of the logic families in the order of their increasing noise margin is

- |                |                |
|----------------|----------------|
| (A) 3, 4, 1, 2 | (B) 3, 4, 2, 1 |
| (C) 4, 3, 1, 2 | (D) 4, 3, 2, 1 |

34. Consider the following communication systems :

1. FM Broadcast
2. AM Broadcast
3. Microwave Communication
4. Optical Fiber Communication

The sequence of the communication systems in the order of their increasing carrier frequency is

- |                |                |
|----------------|----------------|
| (A) 4, 2, 1, 3 | (B) 2, 1, 3, 4 |
| (C) 1, 2, 3, 4 | (D) 3, 4, 1, 2 |

35. The highest data rate can be transmitted using following cables :

1. Co-axial cable
2. Twisted-wire cable
3. Optical fiber cable

The correct sequence in the increasing order is

- |             |             |
|-------------|-------------|
| (A) 1, 3, 2 | (B) 3, 1, 2 |
| (C) 2, 1, 3 | (D) 3, 2, 1 |

36. Match List – I with List – II and select the correct answer using codes given below :

- | List – I        | List – II                                                |
|-----------------|----------------------------------------------------------|
| (a) LASER       | (i) Spontaneous emission                                 |
| (b) Solar Cell  | (ii) Consumes electrical power due to the incident light |
| (c) Photo diode | (iii) Delivers power to a load                           |
| (d) LED         | (iv) Stimulated emission                                 |

Codes :

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

37. List – I

- |                  |                                           |
|------------------|-------------------------------------------|
| (a) BJT          | (i) Pinch off effect                      |
| (b) FET          | (ii) Controlled Rectification             |
| (c) SCR          | (iii) Negative resistance characteristics |
| (d) Tunnel diode | (iv) Punch through effect                 |

List – II

Codes :

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

38. List – I

- |                   |                                                |
|-------------------|------------------------------------------------|
| (a) Ampere's law  | (i) force on a charge                          |
| (b) Biot's law    | (ii) force due to a current carrying conductor |
| (c) Coulomb's law | (iii) electric flux density at a point         |
| (d) Gauss's law   | (iv) magnetic flux density at a point          |

List – II

Codes :

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

39. List – I

- |                              |                                         |
|------------------------------|-----------------------------------------|
| (a) Parallel comparator      | (i) n-bits conversion time              |
| (b) Successive approximation | (ii) Fastest converter                  |
| (c) Dual slope               | (iii) Voltage dependent conversion type |
| (d) Counter type             | (iv) Integrating type                   |

List – II

Codes :

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

- 40. List – I List – II**
- |                                               |                                   |
|-----------------------------------------------|-----------------------------------|
| (a) Frequency modulation                      | (i) Envelope detection            |
| (b) Double sideband suppressed signal carrier | (ii) Companding                   |
| (c) PCM                                       | (iii) Balance modulator           |
| (d) Amplitude modulation                      | (iv) Pre-emphasis and de-emphasis |

**Codes :**

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

- 41. List – I List – II**
- |                  |                    |
|------------------|--------------------|
| (a) LVDT         | (i) Pressure       |
| (b) Bourdon tube | (ii) Temperature   |
| (c) Strain gauge | (iii) Displacement |
| (d) Thermistor   | (iv) Stress        |

**Codes :**

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

- 42. List – I List – II**
- |                     |                           |
|---------------------|---------------------------|
| <b>(Flags)</b>      | <b>(Bit Position)</b>     |
| (a) Sign flag       | (i) 4 <sup>th</sup> bit   |
| (b) Parity          | (ii) 6 <sup>th</sup> bit  |
| (c) Zero            | (iii) 2 <sup>nd</sup> bit |
| (d) Auxiliary carry | (iv) 7 <sup>th</sup> bit  |

**Codes :**

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

- 43. List – I List – II**
- |                |                              |
|----------------|------------------------------|
| (a) Gunn diode | (i) Junctionless device      |
| (b) Solar cell | (ii) Single junction device  |
| (c) MOSFET     | (iii) Double junction device |
| (d) SCR        | (iv) Triple junction device  |

**Codes :**

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

- 44. List – I List – II**
- |                              |                        |
|------------------------------|------------------------|
| (a) Monostable multivibrator | (i) Quasi stable state |
| (b) Astable multivibrator    | (ii) One stable state  |
| (c) Schmitt trigger          | (iii) Two stable state |
| (d) Bistable multivibrator   | (iv) No stable state   |

**Codes :**

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

- 45. List – I**
- |                           |                          |
|---------------------------|--------------------------|
| (a) Semi-conductor memory | (i) Destructive read out |
| (b) Ferrite core memory   | (ii) Combinational logic |
| (c) Magnetic tape memory  | (iii) Non-volatile       |
| (d) Flash memory          | (iv) EEPROM              |

**Codes :**

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

Read the paragraph and answer the question **46 to 50** :

Noise may be defined, in an electrical sense, as an unwanted form of energy tending to interfere with the proper and easy reception and reproduction of wanted signals. Many disturbances of the electrical nature produce noise in receiver, modifying the signal in an unwanted manner. Noise is divided into two groups. Noise whose sources are external to the receiver and other one is noise created within the receiver itself. Various forms of noise created outside the receiver i.e. external noise includes atmospheric and extra-terrestrial noise and industrial noise. Atmospheric noise becomes less severe at frequencies above 30 MHz. Extra-terrestrial noises are solar noise and cosmic noise. They radiate over a very broad frequency spectrum which includes the frequencies, we use for communication. These disturbances are at the eruption of corona flares and sunspots. The noise generated is due to the random motion of electrons, atoms and molecules. Kinetic theory states that the temperature of the system increases due to the motion of the particles.

- 46.** In a communication system, noise is most likely to affect the signal
- at a transmitter
  - in a channel
  - in the information source
  - at the destination
- 47.** Indicate the false statement.
- HF mixers are generally noisier than HF amplifiers.
  - Impulse noise voltage is independent of bandwidth.
  - Thermal noise is independent of the frequency at which it is measured.
  - Industrial noise is usually of the impulse type.
- 48.** The value of a resistor creating thermal noise is doubled. The noise power generated is therefore
- halved
  - quadrupled
  - doubled
  - unchanged
- 49.** One of the following is not a useful quantity for comparing the noise performance of receivers :
- Input noise voltage
  - Equivalent noise resistance
  - Noise temperature
  - Noise figure
- 50.** Indicate the noise whose source is in a category different from that of the other three.
- Solar noise
  - Cosmic noise
  - Atmospheric noise
  - Galactic noise

**Space For Rough Work**