Details and Specifications of Items to be purchased for Autonomous Systems Lab

Expected Cost of Items

Sr. No.	Item Name	Nos	Cost/item (in Lacs)	Total Cost (in Lacs)
1	Outdoor Mobile Manipulator Robot	1	57	57
2	Indoor Mobile robot with 3D vision	2	7.5	15
3	Quadcopters	4	2	8
4	Sensor for Vision based Autononomous Navigation	4	1.6	6.4
5	On Board Computer	2	1.5	3
6	Programming Workstations	5	2	10
Total				99.4

- **Note:** 75.7 Lacs reserved for Items to be purchased as a part of DRDO Projects
- Total Amount: 175.1 Lacs (99.4 + 75.7)

Specification Details

1. **Outdoor Mobile Manipulator Robot**

- Mobile Robot (Husky)

Specification	Husky A200 UGV	Xmachine X100	Neobotix MP-500
Payload	20 kg(avg), 75 kg(max)	50 kg(max)	80 kg (max)
Power and Battery	3hrs(avg) to 8hrs(max)	3hrs	10hrs (max)
Ground Clearance	130 mm	NA	71 mm
Weight	50 kg	75 kg	70 kg
Max Speed	1.0 m/s	1 m/s	1.5 m/s

- Manipulator Arm (Kinova GEN-3 7DOF)

Specification	UR5	Kinova
Payload	5kg	4kg
Horizontal Reach	850mm	902mm
DOF	6	7
Weight	18kg	8.2kg
Power Consumption	200W	36W

2. **Indoor Mobile robot with 3D vision**

Specification Type	Value
Robot Type	Non-Holonomic
Payload capacity (more is better)	50 kgs
Max Velocity (more is better)	1 m/s, 1 rad/s
Wheel Odometry error (lower is better)	2cm/meter (2% error)

3. **Quadcopters**

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Specification Type	Value
Flight Time (more is better)	15-20 mins
Payload capacity (more is better)	1.5 kg
Max Velocity (more is better)	10 m/s
Flight Controller	Cube Orange
Frame Material	Carbon Fibre

4. **Sensor for Vision based Autononomous Navigation**

    - **Stereo/Tracking Camera (Priority)**
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        - intel realsense D455 - Depth
        - intel realsense T265 - Tracking
        - ZED 2i
    - **IMU (Priority)**
        - IMU/AHRS-Xsens
            - Mti 100 DK (1.5L)

- GPS
  - GPS/GNSS-SwiftNav DURO RTK Package
- Lidar
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  - LIDAR 3D- Velodyne VLP-16
  - LIDAR 3D- Velodyne VLP-16 High Res
- Communication
  - RFD 900
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5. **Onborad computer**

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- JETSON AGX Xavier 64 GB

- **Technical Specifications**

GPU	NVIDIA Volta™ architecture with 512 NVIDIA® CUDA® cores and 64 Tensor cores 22 TOPS (INT8)
CPU	8-core NVIDIA Carmel Arm®v8.2 64-bit CPU 8MB L2 + 4MB L3
DL Accelerator	2x NVDLA 10 TOPS (INT8)
Vision Accelerator	2x PVA
Memory	64GB 256-bit LPDDR4x 136.5GB/s
Storage	32GB eMMC 5.1
CSI Camera	Up to 6 cameras (36 via virtual channels) 16 lanes MIPI CSI-2 D-PHY 1.2 (up to 40Gbps) C-PHY 1.1 (up to 62Gbps)
Video Encode	4x 4K60 | 8x 4K30 | 16x 1080p60 | 32x 1080p30 (H.265) 4x 4K60 | 8x 4K30 | 14x 1080p60 | 30x 1080p30 (H.264)
Video Decode	2x 8K30 | 6x 4K60 | 12x 4K30 | 26x 1080p60 | 52x 1080p30 (H.265) 4x 4K60 | 8x 4K30 | 16x 1080p60 | 32x 1080p30 (H.264)
UPHY	8x PCIe Gen4 3x USB 3.1 Single Lane UFS
Networking	10/100/1000 BASE-T Ethernet
Display	Three multi-mode DP 1.2a/e DP 1.4/HDMI 2.0 a/b
Other I/O	USB 2.0 UART, SPI, CAN, I2C, I2S, DMIC & DSPK, GPIOs
Power	10W | 15W | 30W
Mechanical	100mm x 87mm 699 pin Molex Mirror Mezz Connector Integrated Thermal Transfer Plate

- JETSON TX2
  - **Technical Specifications**

GPU	256-core NVIDIA Pascal™ GPU architecture with 256 NVIDIA CUDA cores
CPU	Dual-Core NVIDIA Denver 2 64-Bit CPU Quad-Core ARM® Cortex®-A57 MPCore
Memory	8GB 128-bit LPDDR4 Memory 1866 MHx - 59.7 GB/s
Storage	32GB eMMC 5.1
Power	7.5W / 15W

6. **Programming Workstations**

Specification Type	Value	Expected Cost
CPU	intel i9-12900K	65K
GPU	nvidia RTX 3080	60K
Memory	32 GB (DDR4)	12K
Storage	SDD 500GB	10K
Storage	HDD 1TB	5k
Motherboard	Support Above specs	35k
Total		1.87 Lacs