Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2023

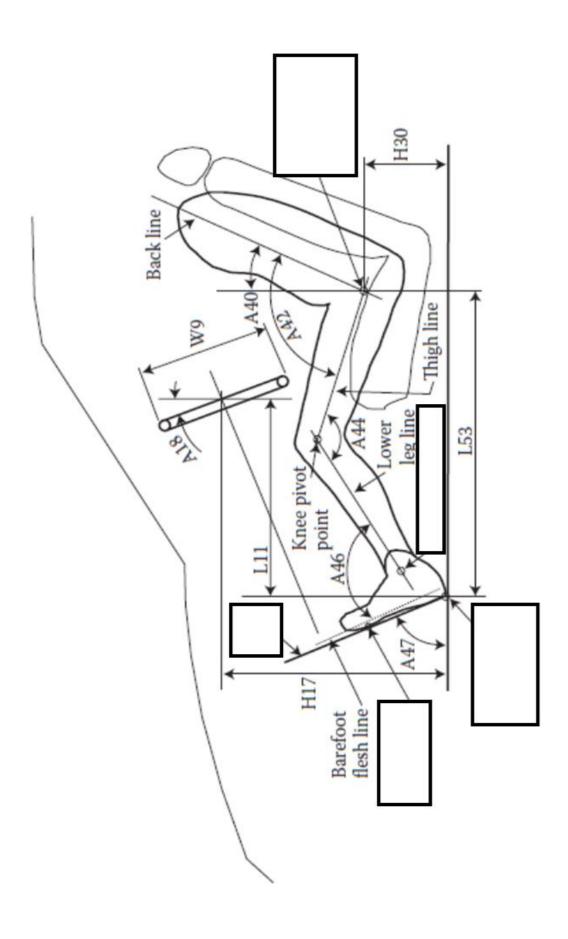
Course: Semester: II

Program: M.Tech. Advanced Vehicles Time : 03 hrs.
Course Code: Vehicle Integration and Ergonomics(MEAV7014P) Max. Marks: 100

Instructions: All the questions are compulsory and assume any missing data.

SECTION A **(5Qx4M=20Marks)** S. No. Ma CO rks Q 1 What do you understand by anthropometry and how it is applied in the field of 4 **CO1** engineering? Define Vehicle packaging? Q 2 4 **CO3** Q 3 Describe the working principle of an ESP. 4 **CO4** Q 4 Identify what percentile of population is considered to design the following seats? (Please refer the anthropometry sheet attached at page no. 5) SEAT 30 lbs 34" CO₂ 34" 27" 22' 20" Q 5 Fill the occupant packaging nomenclature in the boxes shown in figure on page no. 4. **CO3** (Please attach the page) **SECTION B** (4Qx10M = 40 Marks)Discuss the mechanism of independent suspension system along with its focused Q 6 **10 CO4** application area.

| Q 7 | Differentiate between electrically coupled and mechanically coupled hybrid vehicles. | | CO2 | |
|--|---|----|-----|--|
| Q 8 Discuss the functioning of power brake with a schematic diagram. | | | | |
| | OR | 10 | CO4 | |
| | Discuss the structural difference between the mechanical and hydraulic drum brake. | | | |
| Q 9 | Q 9 Discuss and plot the architectural layout of an infotainment system. | | | |
| | SECTION-C | | | |
| | (2Qx20M=40 Marks) | | | |
| Q 10 | Discuss and analyze any two integrations of steering mechanism. | | | |
| | OR | 20 | CO4 | |
| | Discuss and analyze the two steering mechanism which uses drop arm instead of rack. | | | |
| Q 11 | Discuss and analyze all the integrations in vehicle electrical and electronic architecture. | 20 | CO4 | |



| Static Body Dimensions of United States Adults (Values Are in Millimeters) | | | | | | | | |
|--|--|--|--|---|---|--|--|--|
| No. | Measurement | Gender | 5th | 50th | 95th | Std. Dev. | | |
| 1 | Stature: vertical distance from the floor to the vertex | Male | 1647 | 1756 | 1855 | 67 | | |
| | | Female | 1415 | 1516 | 1621 | 63 | | |
| 2 | Stature: vertical distance from the floor to the vertex | Male | 1640 | 1755 | 1870 | 71 | | |
| | | Female | 1520 | 1625 | 1730 | 64 | | |
| 3 | Stature: vertical distance from the floor to the vertex | Male | 1670 | 1790 | 1900 | 70 | | |
| | | Female | 1540 | 1650 | 1760 | 67 | | |
| 4 | Stature: vertical distance from the floor to the vertex | Male | 1636 | 1763 | 1887 | 76 | | |
| | | Female | 1507 | 1622 | 1731 | 68 | | |
| 5 | Stature: vertical distance from the floor to the vertex | Male | 1665 | 1756 | 1880 | 62 | | |
| | | Female | 1572 | 1643 | 1708 | 64 | | |
| 6 | Eye height: vertical distance from the floor to the eyes | Male | 1528 | 1634 | 1743 | 66 | | |
| | | Female | 1415 | 1516 | 1621 | 62 | | |
| 7 | Shoulder height: hertical distance from the floor to the acromion | Male | 1342 | 1442 | 1546 | 62 | | |
| | | Female | 1241 | 1334 | 1432 | 58 | | |
| 8 | Elbow height: vertical distance from the floor to the radiale | Male | 995 | 1072 | 1153 | 48 | | |
| _ | | Female | 926 | 998 | 1074 | 45 | | |
| 9 | Wrist height: vertical distance from the floor to the wrist | Male | 778 | 846 | 915 | 41 | | |
| 10 | Sinisa kaiska saatisal distance from the sinisa saafaa ta dha saataa | Female | 728 | 790 | 855 | 39 | | |
| 10 | Sitting height: vertical distance from the sitting surface to the vertex | Male | 854 | 914 | 972 | 36 | | |
| 11 | Citting bailett continued distance from the citting conform to the contact | Female | 795 | 852 | 910 975 | 25 36 | | |
| 11 | Sitting height: vertical distance from the sitting surface to the vertex | Male Female | 855 800 | 915 860 | 973 | 36 | | |
| 12 | Sitting eye height: vertical distance from the sitting surface to the eyes | Male | 735 | 792 | 848 | 34 | | |
| 12 | Sitting eye neight, vertical distance from the sitting surface to the eyes | Female | 685 | 739 | 794 | 33 | | |
| 13 | Sitting eye height: vertical distance from the sitting surface to the eyes | Male | 749 | 811 | 863 | 38 | | |
| 15 | Stung eye neight. Vertical distance from the stung surface to the eyes | Female | 736 | 761 | 849 | 41 | | |
| 14 | Sitting shoulder height: vertical distance from the sitting surface to the acromion | Male | 548 | 598 | 646 | 30 | | |
| | Stang shoulder height. Vertical distance from the stang surface to the deformor | Female | 509 | 555 | 604 | 29 | | |
| | | | | | | | | |
| No. | Measurement | Gender | 5th | 50th | 95th | Std. De | | |
| No. 15 | | | 5th 184 | 50th 232 | 95th 274 | Std. Det | | |
| | Measurement Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow | | | | | | | |
| | Sitting elbow height: vertical distance from the sitting surface to the underside of | of Male | 184 | 232 | 274 | 27 | | |
| 15 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow | of Male Female | 184 176 | 232 220 | 274 264 | 27 27 | | |
| 15 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh | of Male Female Male | 184 176 149 | 232 220 168 | 274 264 190 | 27 27 13 | | |
| 15 16 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface | of Male Female Male Female | 184 176 149 140 | 232 220 168 159 | 274 264 190 180 | 27 27 13 12 | | |
| 15 16 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal | Female Male Female Male Male Female | 184 176 149 140 229 | 232 220 168 159 299 | 274 264 190 180 374 | 27 27 13 12 45 | | |
| 15 16 17 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension | Female Male Female Male Male Female | 184 176 149 140 229 195 | 232 220 168 159 299 247 | 274 264 190 180 374 309 | 27 27 13 12 45 48 | | |
| 15 16 17 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the | of Male Female Male Female Male Female Male Female Male Female | 184 176 149 140 229 195 514 | 232 220 168 159 299 247 559 | 274 264 190 180 374 309 606 | 27 27 13 12 45 48 28 | | |
| 15 16 17 18 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee | of Male Female Male Female Male Female Male Female Male Female | 184 176 149 140 229 195 514 474 | 232 220 168 159 299 247 559 515 | 274 264 190 180 374 309 606 560 | 27 27 13 12 45 48 28 26 | | |
| 15 16 17 18 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder | of Male Female Male Female Male Female Male Female Male Female Male | 184 176 149 140 229 195 514 474 395 | 232 220 168 159 299 247 559 515 434 | 274 264 190 180 374 309 606 560 476 | 27 27 13 12 45 48 28 26 25 | | |
| 15 16 17 18 19 20 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level | of Male Female Male Female Male Female Male Female Male Female Male Female Female Male Female Male Female | 184 176 149 140 229 195 514 474 395 351 739 677 | 232 220 168 159 299 247 559 515 434 389 801 735 | 274 264 190 180 374 309 606 560 476 429 867 797 | 27 27 13 12 45 48 28 26 25 24 39 36 | | |
| 15 16 17 18 19 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level Buttock-to-knee distance (sitting): horizontal distance from the back of | Female Male Female Male Female Male Female Male Female Male Female Male | 184 176 149 140 229 195 514 474 395 351 739 677 596 | 232 220 168 159 299 247 559 515 434 389 801 735 616 | 274 264 190 180 374 309 606 560 476 429 867 797 667 | 27 27 13 12 45 48 28 26 25 24 39 36 30 | | |
| 15 16 17 18 19 20 21 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level Buttock-to-knee distance (sitting): horizontal distance from the back of uncompressed buttock to the front of the kneecap | Female Male Female Female Male Female Female Male Female | 184 176 149 140 229 195 514 474 395 351 739 677 596 542 | 232 220 168 159 299 247 559 515 434 389 801 735 616 589 | 274 264 190 180 374 309 606 560 476 429 867 797 667 640 | 27 27 13 12 45 48 28 26 25 24 39 36 30 30 | | |
| 15 16 17 18 19 20 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level Buttock-to-knee distance (sitting): horizontal distance from the back of uncompressed buttock to the front of the kneecap Buttock-to-popliteal distance (sitting): horizontal distance from the back of | f Male Female Male | 184 176 149 140 229 195 514 474 395 351 739 677 596 542 458 | 232 220 168 159 299 247 559 515 434 389 801 735 616 589 500 | 274 264 190 180 374 309 606 560 476 429 867 797 667 640 545 | 27 27 13 12 45 48 28 26 25 24 39 36 30 30 27 | | |
| 15 16 17 18 19 20 21 22 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level Buttock-to-knee distance (sitting): horizontal distance from the back of uncompressed buttock to the front of the kneecap Buttock-to-popliteal distance (sitting): horizontal distance from the back of uncompressed buttock to the back of the knee | of Male Female Female Female Female | 184 176 149 140 229 195 514 474 395 351 739 677 596 542 458 | 232 220 168 159 299 247 559 515 434 389 801 735 616 589 500 482 | 274 264 190 180 374 309 606 560 476 429 867 797 667 640 545 528 | 27 27 13 12 45 48 28 26 25 24 39 36 30 30 27 27 | | |
| 15 16 17 18 19 20 21 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level Buttock-to-knee distance (sitting): horizontal distance from the back of uncompressed buttock to the front of the kneecap Buttock-to-popliteal distance (sitting): horizontal distance from the back of uncompressed buttock to the back of the knee | of Male Female Male | 184 176 149 140 229 195 514 474 395 351 739 677 596 542 458 440 448 | 232 220 168 159 299 247 559 515 434 389 801 735 616 589 500 482 484 | 274 264 190 180 374 309 606 560 476 429 867 797 667 640 545 528 | 27 27 13 12 45 48 28 26 25 24 39 36 30 30 27 27 27 | | |
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| 15 16 17 18 19 20 21 22 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level Buttock-to-knee distance (sitting): horizontal distance from the back of uncompressed buttock to the front of the kneecap Buttock-to-popliteal distance (sitting): horizontal distance from the back of uncompressed buttock to the back of the knee Elbow-to-fingertip distance: horizontal distance from the back of the elbow to middle-finger tip with lower arm horizontal in sitting position Forearm-to-forearm breadth: horizontal distance between the outermost points | remale Male Female Male | 184 176 149 140 229 195 514 474 395 351 739 677 596 542 458 440 448 406 474 | 232 220 168 159 299 247 559 515 434 389 801 735 616 589 500 482 484 443 546 | 274 264 190 180 374 309 606 560 476 429 867 797 667 640 545 528 524 482 620 | 27 27 13 12 45 48 28 26 25 24 39 36 30 30 27 27 23 23 | | |
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| 15 16 17 18 19 20 21 22 23 24 25 26 27 | Sitting elbow height: vertical distance from the sitting surface to the underside of the elbow Thigh height: vertical distance from the sitting surface to highest top of thigh surface Seated stomach depth: horizontal depth of trunk at the level of abdominal extension Knee height (sitting): vertical distance from the floor to the upper surface of the knee Popliteal height (sitting): vertical distance from the floor to the underside of the knee Forward thumb tip reach: horizontal distance from the back of the shoulder blade to thumb tip with arm raised at shoulder level Buttock-to-knee distance (sitting): horizontal distance from the back of uncompressed buttock to the front of the kneecap Buttock-to-popliteal distance (sitting): horizontal distance from the back of uncompressed buttock to the back of the knee Elbow-to-fingertip distance: horizontal distance from the back of the elbow to middle-finger tip with lower arm horizontal in sitting position Forearm-to-forearm breadth: horizontal distance between the outermost points on the forearms in sitting position Hip breadth (sitting): maximum horizontal distance across the hips in the sitting position Foot length: distance from the back of the heel to the tip on the longest toe measured in longitudinal (forward) axis Shoe length: distance from back of heel to front edge of sole | of Male Female Female Male Female Female Female Male Female Female Male Female Female Male Female Male Female Male Female Male Female Male | 184 176 149 140 229 195 514 474 395 351 739 677 596 542 458 440 448 406 474 415 329 342 249 224 277 241 | 232 220 168 159 299 247 559 515 434 389 801 735 616 589 500 482 484 443 546 468 367 384 270 244 299 264 | 274 264 190 180 374 309 606 560 476 429 867 797 667 640 545 528 524 482 620 528 412 432 292 264 319 286 | 27 27 13 12 45 48 28 26 25 24 39 36 30 30 27 27 23 23 44 35 25 27 13 12 | | |