**Project – 2**

**vinod sake**

**Problem 1:**

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| **Problem 1 - branch prediction** |  |  |  |
| **Trace** | **bimodal** | **PAg - 128** | **PAg - 512** |
| astar\_163B\_50M | 74.4939 | 90.1207 | 92.6884 |
| bwaves\_1861B\_50M | 81.2193 | 99.9014 | 99.9502 |
| bzip2\_183B\_50M | 90.2581 | 86.2746 | 88.8182 |
| gcc\_13B\_50M | 92.3782 | 93.4848 | 96.5422 |
| GemsFDTD\_109B\_50M | 99.5228 | 99.5606 | 99.5685 |
| lbm\_94B\_50M | 98.753 | 99.3951 | 99.3951 |
| leslie3d\_1116B\_50M | 98.2522 | 98.1797 | 98.6011 |
| libquantum\_1210B\_50M | 85.6962 | 98.5633 | 99.9937 |
| mcf\_46B\_50M | 87.1969 | 92.0786 | 93.0937 |
| milc\_360B\_50M | 99.9982 | 99.9991 | 99.9991 |
| omnetpp\_340B\_50M | 93.1968 | 90.7941 | 95.0742 |
| soplex\_66B\_50M | 92.9669 | 93.0347 | 93.5831 |
| sphinx3\_2520B\_50M | 95.9391 | 95.9093 | 96.1831 |
| wrf\_1212B\_50M | 96.9415 | 96.2368 | 98.5878 |
| xalancbmk\_748B\_50M | 96.8668 | 92.3549 | 97.2371 |
| **Arithmetic Mean** | **92.24532667** | **95.05918** | **96.62103333** |

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| **Problem 1 - IPC** |  |  |  |  |  |
| **Trace** | **bimodal** | **PAg - 128** | **% imp** | **PAg - 512** | **% imp** |
| astar\_163B\_50M | 0.331881 | 0.418594 | 26.12774 | 0.438821 | 32.22239 |
| bwaves\_1861B\_50M | 0.694852 | 0.725193 | 4.366541 | 0.725433 | 4.401081 |
| bzip2\_183B\_50M | 0.83362 | 0.751556 | -9.844294 | 0.803032 | -3.6693 |
| gcc\_13B\_50M | 0.18919 | 0.190959 | 0.935039 | 0.194571 | 2.844231 |
| GemsFDTD\_109B\_50M | 0.439453 | 0.439458 | 0.001138 | 0.439487 | 0.007737 |
| lbm\_94B\_50M | 0.494307 | 0.494347 | 0.008092 | 0.494347 | 0.008092 |
| leslie3d\_1116B\_50M | 0.707987 | 0.707445 | -0.076555 | 0.707783 | -0.02881 |
| libquantum\_1210B\_50M | 0.235601 | 0.435039 | 84.65074 | 0.497377 | 111.1099 |
| mcf\_46B\_50M | 0.087858 | 0.103533 | 17.84129 | 0.104569 | 19.02046 |
| milc\_360B\_50M | 0.592034 | 0.592036 | 0.000338 | 0.592036 | 0.000338 |
| omnetpp\_340B\_50M | 0.242286 | 0.233343 | -3.691092 | 0.250261 | 3.291565 |
| soplex\_66B\_50M | 0.339286 | 0.340117 | 0.244926 | 0.34594 | 1.961177 |
| sphinx3\_2520B\_50M | 0.737687 | 0.74091 | 0.436906 | 0.744767 | 0.959757 |
| wrf\_1212B\_50M | 0.544402 | 0.535366 | -1.659803 | 0.552821 | 1.546468 |
| xalancbmk\_748B\_50M | 0.399627 | 0.374277 | -6.343415 | 0.40364 | 1.004186 |
| **Geometric Mean** | **0.395446831** | **0.418342361** |  | **0.431850647** |  |

**Problem 2:**

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| **Problem 2 - branch prediction** |  |  |  |
| **Trace** | **bimodal** | **gshare - 1024** | **gshare - 4096** |
| astar\_163B\_50M | 74.4939 | 90.8024 | 92.9464 |
| bwaves\_1861B\_50M | 81.2193 | 96.8277 | 96.8274 |
| bzip2\_183B\_50M | 90.2581 | 86.5248 | 87.7918 |
| gcc\_13B\_50M | 92.3782 | 96.0495 | 96.4851 |
| GemsFDTD\_109B\_50M | 99.5228 | 94.3974 | 99.5048 |
| lbm\_94B\_50M | 98.753 | 99.3951 | 99.3943 |
| leslie3d\_1116B\_50M | 98.2522 | 97.6933 | 98.1823 |
| libquantum\_1210B\_50M | 85.6962 | 92.8462 | 94.6211 |
| mcf\_46B\_50M | 87.1969 | 92.8489 | 94.1715 |
| milc\_360B\_50M | 99.9982 | 99.9964 | 99.996 |
| omnetpp\_340B\_50M | 93.1968 | 91.7249 | 95.2313 |
| soplex\_66B\_50M | 92.9669 | 93.0075 | 93.3811 |
| sphinx3\_2520B\_50M | 95.9391 | 95.6296 | 98.0373 |
| wrf\_1212B\_50M | 96.9415 | 97.144 | 98.562 |
| xalancbmk\_748B\_50M | 96.8668 | 94.9157 | 97.1886 |
| **Arithmetic Mean** | **92.24532667** | **94.65356** | **96.15473333** |

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| **Problem 2 - IPC** |  |  |  |  |  |
| **Trace** | **bimodal** | **gshare - 1024** | **% imp** | **gshare - 4096** | **% imp** |
| astar\_163B\_50M | 0.331881 | 0.418162 | 25.99757 | 0.433306 | 30.56065 |
| bwaves\_1861B\_50M | 0.694852 | 0.721411 | 3.822253 | 0.721411 | 3.822253 |
| bzip2\_183B\_50M | 0.83362 | 0.759457 | -8.8965 | 0.782229 | -6.1648 |
| gcc\_13B\_50M | 0.18919 | 0.190763 | 0.831439 | 0.191893 | 1.428722 |
| GemsFDTD\_109B\_50M | 0.439453 | 0.421412 | -4.105331 | 0.43941 | -0.00978 |
| lbm\_94B\_50M | 0.494307 | 0.494347 | 0.008092 | 0.494346 | 0.00789 |
| leslie3d\_1116B\_50M | 0.707987 | 0.706793 | -0.168647 | 0.70709 | -0.1267 |
| libquantum\_1210B\_50M | 0.235601 | 0.294549 | 25.02027 | 0.32462 | 37.7838 |
| mcf\_46B\_50M | 0.087858 | 0.104574 | 19.02616 | 0.106284 | 20.97248 |
| milc\_360B\_50M | 0.592034 | 0.592028 | -0.001013 | 0.592028 | -0.00101 |
| omnetpp\_340B\_50M | 0.242286 | 0.233262 | -3.724524 | 0.248841 | 2.70548 |
| soplex\_66B\_50M | 0.339286 | 0.340504 | 0.358989 | 0.343354 | 1.198988 |
| sphinx3\_2520B\_50M | 0.737687 | 0.737624 | -0.00854 | 0.747677 | 1.354233 |
| wrf\_1212B\_50M | 0.544402 | 0.543351 | -0.193056 | 0.552833 | 1.548672 |
| xalancbmk\_748B\_50M | 0.399627 | 0.388027 | -2.902707 | 0.400504 | 0.219455 |
| **Geometric Mean** | **0.395446831** | **0.408082708** |  | **0.418055586** |  |

**Problem 3:**

**Bimodal:**

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| **Problem 1 - Storage** | **Table size** | **counter** | **Total Storage** | **Formula** |
| **bimodal** | 16384 | 2 | **32768** | Table size \* counter bits) |

**PAg:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Problem 1 - Storage** | **PBHT** | **no.of branch history bits** | **GPHT** | **counter** | **Total Storage** | **Formula** |
| **Pag - 128** | 128 | 8 | 256 | 2 | **1536** | (PBHT \* branch history bits) + (GPHT \* counter bits) |
| **pag - 512** | 512 | 12 | 4096 | 2 | **14336** |

**Gshare:**

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| --- | --- | --- | --- | --- | --- |
| **Problem 1 - Storage** | **GHR bits** | **GPT** | **counter** | **Total** | **Formula** |
| **gshare - 1024** | 10 | 1024 | 2 | **2058** | GHR bits + (GPT \* counter bits) |
| **gshare - 4096** | 12 | 4096 | 2 | **8204** |