CSO ASSIGNMENT-2

Roll No.:2021101006

Problem3:

- **Operating system:** Ubuntu 20.04.2 LTS
- **Kernel modules:**

-Loaded Modules-
rfcomm : Bluetooth RFCOMM ver 1.11,
ccm : Counter with CBC MAC,
cmac : CMAC keyed hash algorithm,
algif_hash,algif_skcipher.af_alg.bnep,nls_iso8859_1,snd_ctl_le,
snd_soc_skl_hda_dsp,Machinedriver,snd_soc_intel_hda_dsp_common ,helpers,snd_soc_hdac_hdmi ,snd_hda_codec_hdmi,nvidia_uvm,snd_hda_codec_realtek,snd_hda_codec_generic,nvidia_drm,nvidia_modeset,intel_tcc_cooling ,x86_pkg_temp_thermal,intel_powerclams,IntelCPUs,nvidia,coretemps,snd_soc_dmic,snd_sof_pci_intel_tgl,snd_sof_intel_hda_common,soundwire_intel,soundwire_generic_allocation,Bandwidth,Allocation,soundwire_cadence,snd_sof_intel_hda,snd_sof_pci,snd_sof_xtensa_dsp,snd_sof,snd_soc_hdac_hda,snd_hda_ext_core,snd_soc_acpi_intel_match,
snd_soc_acpi,soundwire_bus,snd_soc_core,snd_compress,ac97_bus,snd_pcm_dmaengine,snd_hda_intel ,snd_intel_dspcfg,snd_intel_sdw_acpi,snd_hda_codec,snd_hda_core,snd_hwdep,snd_pcm,snd_seq_midi,kvm_intel,mei_hdcp,snd_seq_midi_event,eventcoder,kvmath10k_pci ,snd_rawmidi,uvcvideo,videobuf2_vmalloc, videobuf2,.....

- **File systems:**

-Mounted File Systems-
udev /dev 0.00 % (3.7 GiB of 3.7 GiB)
tmpfs /run 0.31 % (765.5 MiB of 767.9 MiB)
/dev/nvme0n1p7 / 30.61 % (56.9 GiB of 82.0 GiB)
tmpfs /dev/shm 0.85 % (3.7 GiB of 3.7 GiB)
tmpfs /run/lock 0.08 % (5.0 MiB of 5.0 MiB)
tmpfs /sys/fs/cgroup 0.00 % (3.7 GiB of 3.7 GiB)
/dev/loop0 /snap/core18/2409 100.00 % (0.0 B of 55.6 MiB)
/dev/loop3 /snap/snap-store/518 100.00 % (0.0 B of 51.1 MiB)
/dev/loop2 /snap/gnome-3-38-2004/106 100.00 % (0.0 B of 254.1 MiB) ,.....

- **Processor:**

11th Gen Intel(R) Core(TM) i5-1135G7 @2.40GHZ
1 physical processor;4 cores;8 threads

- **Memory:**

MemTotal Total Memory 7863228 KiB
MemFree Free Memory 903660 KiB
MemAvailable 3397184 KiB

- **PCI devices:**

Host bridge : Intel Corporation Device 9a14 (rev 01)
VGA compatible controller : Intel Corporation Device 9a49 (rev 01) (prog-if 00 [VGA controller])
Signal processing controller : Intel Corporation Device 9a03 (rev 01)
PCI bridge : Intel Corporation Device 9a09 (rev 01) (prog-if 00 [Normal decode])
Signal processing controller : Intel Corporation Device 9a0d (rev 01)
RAID bus controller : Intel Corporation Volume Management Device NVMe RAID Controller

USB controller : Intel Corporation Device a0ed (rev 20) (prog-if 30 [XHCI])
RAM memory : Intel Corporation Device a0ef (rev 20)

- **USB devices:**

Linux Foundation 3.0 root hub,Microdia Integrated_Webcam_HD,
Shenzhen Goodix Technology Co.,Ltd. FingerPrint,Logitech, Inc. Unifying Receiver
Qualcomm Atheros Communications,Linux Foundation 2.0 root hub

- **Battery:**

-Battery: BAT0-
State: Charging,Capacity: 80 / Normal, Technology: Li-poly,Manufacturer : BYD,
Model Number DELL 1VX1H17,Serial Number : 1939

- **Sensors:**

../../BAT0/in0 Voltage 12.70V,../../nvme0/temp1 Temperature 27.85°C
../../nvme0/temp2 Temperature 27.85°C,dell_smm/fan1 Fan 3649.00RPM
coretemp/temp1 Temperature 67.00°C,coretemp/temp2 Temperature 57.00°C
coretemp/temp3 Temperature 67.00°C,coretemp/temp4 Temperature 60.00°C
coretemp/temp5 Temperature 65.00°C,thermal/thermal_zone2 Temperature 56.05°C
thermal/thermal_zone0 Temperatur20.00°C,thermal/thermal_zone5Temperature69.00°C
thermal/thermal_zone3Temperature62.05°C,thermal/thermal_zone1Temperature53.05°C
thermal/thermal_zone4 Temperature 64.05°C

- **Storage:**

-SCSI Disks-ATA TOSHIBA MQ04ABF1

- **DMI:**

-Product-
Name : Vostro 3500,Family: Vostro,Vendor: Dell Inc. (Dell Computer, www.dell.com)
Version: (Not available; Perhaps try running HardInfo as root.)
-BIOS-
Date: 04/12/2022,Vendor: Dell Inc. (Dell Computer, www.dell.com),Version: 1.14.0
-Board-
Name : 0F5KMR,Vendor: Dell Inc. (Dell Computer, www.dell.com),Version: A00
Serial Number: (Not available; Perhaps try running HardInfo as root.)
Asset Tag: (Not available; Perhaps try running HardInfo as root.)
-Chassis-
Vendor: Dell Inc. (Dell Computer, www.dell.com),Type: [10] Notebook
Version: (Not available; Perhaps try running HardInfo as root.)
Serial Number: (Not available; Perhaps try running HardInfo as root.)
Asset Tag: (Not available; Perhaps try running HardInfo as root.)

- **Benchmark scores:**

Benchmark score of CPU Zlib:

-CPU Zlib-
11th Gen Intel(R) Core(TM) i5-1135G7 @ 2.40GHz 8x 4200.00 MHz 1.45
PowerPC 740/750 1x 280.00 MHz 2150.60_____

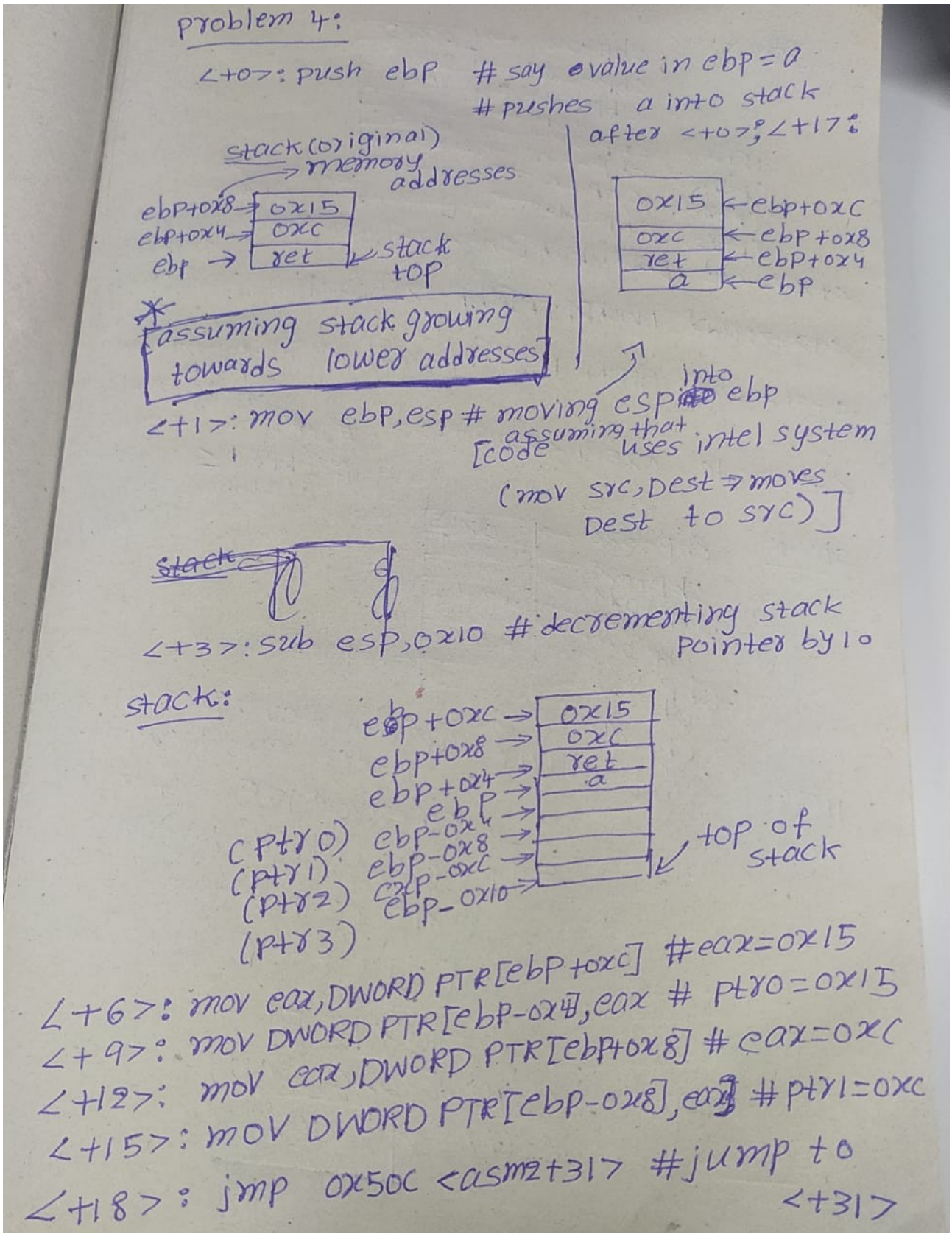
Benchmark score of GPU Drawing:

-GPU Drawing-
11th Gen Intel(R) Core(TM) i5-1135G7 @ 2.40GHz 8x 4200.00 MHz 22309.35

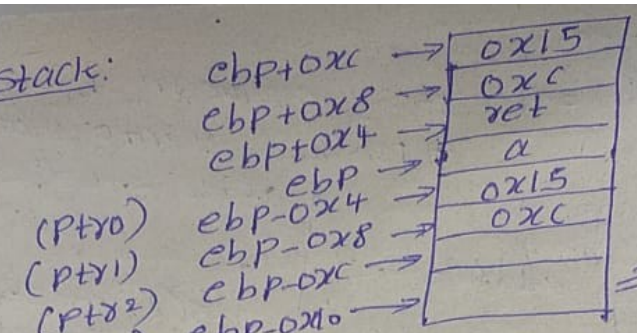
Problem4:

- assemblycode (0xc,0x15) returns **0x105**

Exp:



stack:



(ptr0) (ptr1) (ptr2) (ptr3)

<+20>: add DWORD PTR [ebp-0x4], 0x1 # ptr0 = 0x16 (0x15+0x1)

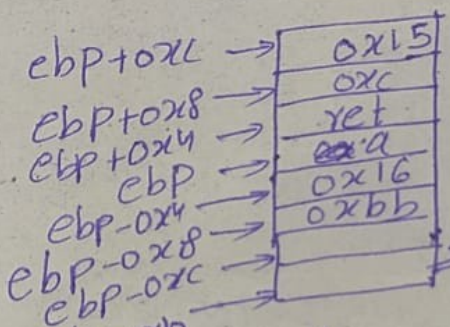
<+24>: add DWORD PTR [ebp-0x8], 0xaf # ptr1 = 0xbb [0xc+0xaf]

<+31>: cmp DWORD PTR [ebp-0x8], 0xa3d3 # compare ptr1 (0xbb), 0xa3d3

<+38>: jle 0x501 <asm2+207> # jump to <+207>

if (ptr1 ≤ 0xa3d3) (0xbb) → after one iteration

stack:



Here while (ptr1 ≤ 0xa3d3) terminates after 240 iterations

[12 + 240 * 175 > 41939]

<+43>: leave # exit from loop

<+44>: ret # return ptr0

⇒ ebp - 0x4 (ptr0) becomes

0x15 + 240 (0x1)

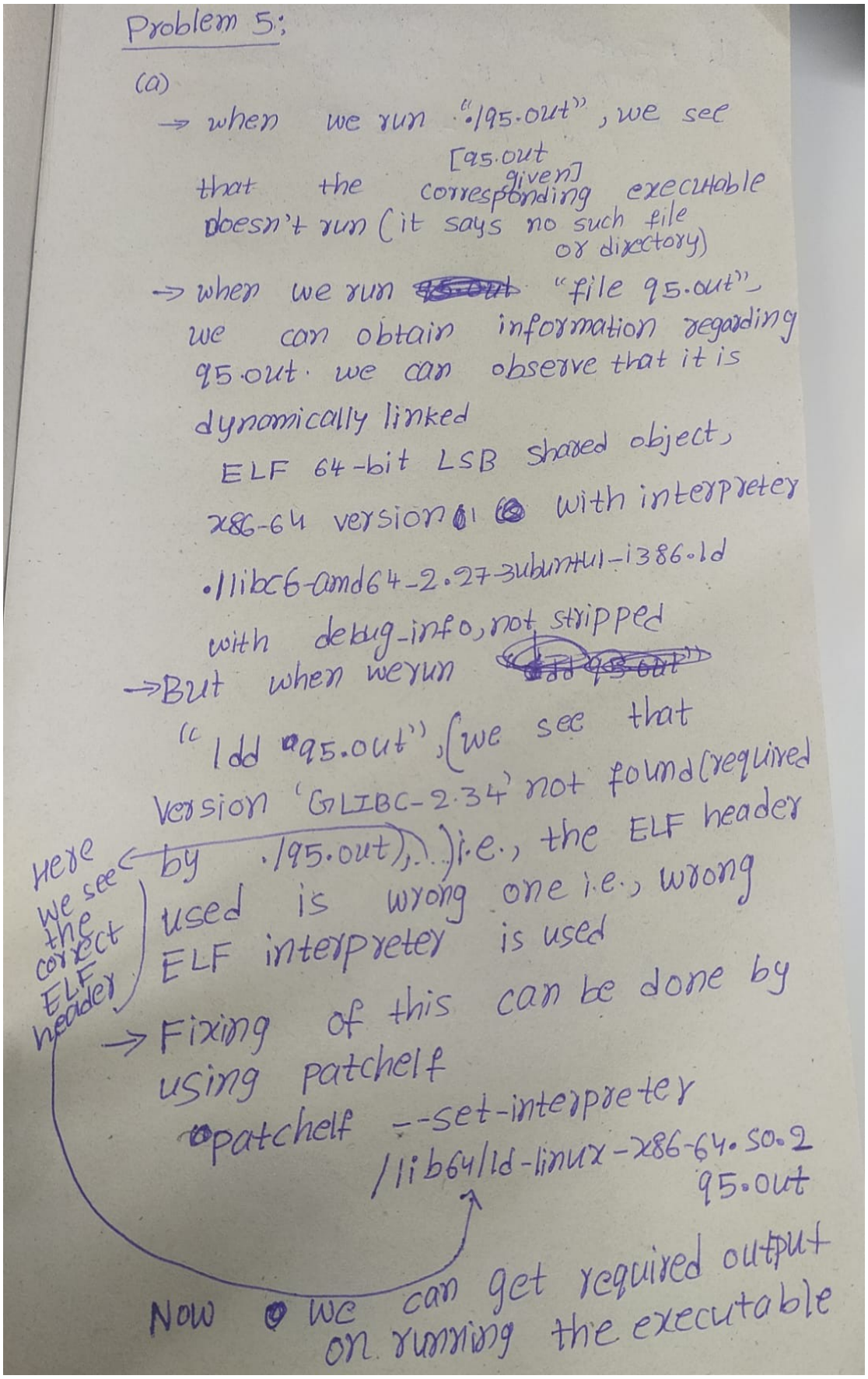
[21 + 240 * 1 = 261]

= 0x105

⇒ assembly code (0xc, 0x15)

returns * 0x105

Problem5:


Problem 5:
(a)
→ when we run "./95.out", we see that the corresponding [95.out given] executable doesn't run (it says no such file or directory)
→ when we run "file 95.out", we can obtain information regarding 95.out. we can observe that it is dynamically linked
ELF 64-bit LSB shared object, x86-64 version 1 with interpreter ./lib6-amd64-2.27-3ubuntu1-i386.ld with debug_info, not stripped
→ But when we run "ldd 95.out", (we see that version 'GLIBC-2.34' not found (required by ./95.out)..) i.e., the ELF header used is wrong one i.e., wrong ELF interpreter is used
Here we see the correct ELF header
→ Fixing of this can be done by using patchelf
patchelf --set-interpreter /lib64/ld-linux-x86-64.so.2 95.out
Now we can get required output on running the executable

(b) Information can be inferred from binary file by running readelf -h a5.out

~~readelf -h a5~~

[ELF Header:
Magic: 7f 45 4c 46 02 01 01 00 00 00 00 00 00 00 00 00
Class: ELF64
Data: 2's complent, little endian
Version: 1 (current)
OS/ABI: UNIX-System V
ABI version: 0
Type: DYN (Shared object file)
Machine: Advanced Micro Devices X86-64
Version: 0x1
Entry point address: 0x1040
Start of program headers: 64 (bytes into file)
start of section headers: 18168 (bytes into file)
Flags: 0x0
Size of this header: 64 (bytes)
Size of program headers: 56 (bytes)
Number of program headers: 18
Size of section headers: 64 (bytes)
Number of section headers: 37
section header string table index: 30]