MANIPAL INSTITUTE OF TECHNOLOGY
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SEVENTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
NOV 2017
SUBJECT: ADV. EMBEDDED SYSTEM DESIGN (ECE - 421)

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to candidates
- Answer **ANY FIVE** questions.
- Missing data may be suitably assumed.

1A. Explain grep and trap commands of Linux. Write shell script to do the following:
Create a file */tmp/aesd_exam* and copy date into it. Use trap command to arrange file */tmp/aesd_exam* deletion when user presses *Ctrl+C*. Create a while loop to display the message "examination" as long as file */tmp/aesd_exam* exists. Display the message "file deleted" when user presses Ctrl+C.

1B. Assume the script in **Figure Q1B** is written and saved in a file "*AESD.sh*"
  i). Write the command to execute the script by providing suitable parameters.
  ii). Explain the behaviour of script at each line and write corresponding output for the parameters given in part (i).

1C. Write advantages of Command Line Interface over Graphical User Interface of Linux.

(5+3+2)

2A. Explain the boot modes available in BeagleBone Black. Write the usage of boot switch which is provided to allow switching between the modes.

2B. Draw the high level block diagram of BeagleBone Black and explain each block briefly.

2C. Explain the functionality of power button on BeagleBone Black.

(5+3+2)

3A. Write Linux commands to do the following
  i). To Reboot BBB
  ii). To know the type and version of Linux distribution on BBB
  iii). To make script file */tmp/script.sh* executable
  iV). To install gedit
  V). To clone a repository *ee402* from *github.com/derekmolloy*

3B. Write the advantages and disadvantages of BBB internet-over-USB

3C. Write the default
  i). IP address of Cloud9 IDE on BBB webserver
  ii). Internet-over-USB address of bone101 script on BBB
  iii). Linux distribution on BBB
  iV). Webserver on BBB

(5+3+2)

4A. Using **Table Q4A**, Configure pru_pins in the device tree overlay fragment shown in **Figure Q4A** for the following modes

i). P9_27 → pr1_pru0_pru_r30_5, output, pullup & pulldown disable, fast slew

ii). P9_28 → pr1_pru0_pru_r31_3, input, pullup & pulldown disable, fast slew

iii). P9_29 → pr1_pru0_pru_r30_1, output, pullup enable, fast slew

iv). P9_30 → pr1_pru0_pru_r30_2, output, pulldown enable, slow slew

v). P8_46→ pr1_pru1_pru_r30_1, input, pullup & pulldown disable, slow slew

4B. Write BBB's PRU program to flash the LED connected to *pr1_pru0_pru_r30_5* until a button that is connected to *pr1_pru0_pru_r31_3* is pressed.

4C. Explain the possible ways of achieving real-time capability for BBB.

(5+3+2)

5A. Write a socket client program *client.c* to create an unnamed socket, connect it to a server socket called *server_socket* and write into and read from *server_socket*.

5B. Explain the syntax of following Linux system calls and write a C program to copy first 128 bytes of the standard input to the standard output

i). size_t read(int fildes, void *buf, size_t nbytes);

ii). size_t write(int fildes, const void *buf, size_t nbytes);

5C. Write the series of commands need to be executed to replace the gadget serial service of BBB with custom application service

(5+3+2)

6A. Write C++ application for BBB that reads analogue input. Structure it in such a way that analogue value from any of the AIN pins of BBB can be read by passing the pin number (0-6) to the *readAnalog()* function. Display the result on console.

6B. Assume *bone_pwm_P9_22* is the DTO of PWM output through P9_22. Write the procedure to load this overlay and to generate a PWM wave of 100Khz period with 50% duty cycle

6C. Write the significance of following BBB Linux commands

i). hcitool scan   ii). pasm –b ledbutton.p

iii). dtc –O dtb –o EBB-GPIO.dtbo –b 0 -@ EBB-GPIO.dts

iV). i2cget –y 1 0x53 0x00

(5+3+2)

```
#!/bin/sh
salutation= "Hello"
echo $salutation
echo "$0"
echo "$2"
echo "$1"
echo "$*"
echo "$#"
echo "$HOME"

echo "Please enter a new greeting"
read salutation
echo $salutation
echo "The script is now complete"
exit 0
```

Figure Q1B

```
fragment@0 {
        target = <&am33xx_pinmux>;
        __overlay__ {
        pru_pru_pins: pinmux_pru_pru_pins {
        pinctrl-single,pins = <
        // PRU PIN MODES NEED TOBE CONFIGURED HERE//
        >; }; }; };
```

Figure Q4A

$PINS	ADDR	MODE7	MODE6	MODE5
P9_27	0x184	Gpio3[19]	pr1_pru0_pru_r31_5	pr1_pru0_pru_r30_5
P9_28	0x19c	Gpio3[17]	pr1_pru0_pru_r31_3	pr1_pru0_pru_r30_5
P9_29	0x194	Gpio3[15]	pr1_pru0_pru_r31_1	pr1_pru0_pru_r30_5
P9_30	0x198	Gpio3[16]	pr1_pru0_pru_r31_2	pr1_pru0_pru_r30_5
P8_46	0x0a4	Gpio2[7]	pr1_pru1_pru_r31_1	pr1_pru0_pru_r30_5

Table Q4A