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ESE- 2019 (Prelims) - Offline Test Series Test-11

Electronics & Telecommunication Engineering

SUBJECT: COMPUTER ORGANIZATION AND ARCHITECTURE, ADVANCED COMMUNICATION AND ADVANCED ELECTRONICS

SOLUTIONS

01. Ans: (a)

Sol: TLB can be used to store few of the page table or segment table entries to decrease effective memory access time.

02. Ans: (c)

Sol: Effective memory access time

$= 0.1 * 1000 + 0.9 * 60$

$= 100+54$

$= 154$ nsec

03. Ans: (d)

Sol: Size of ROM = No. of multiplication results * 1 result size

$= (2^4 * 2^4) * 8\text{-bits}$

$= 2^8 * 8\text{-bits}$

$= 2^{11}\text{-bits}$

$= 2K$ bits

04. Ans: (d)

Sol: $512k \times 8\text{-bits} \Rightarrow 2^{19} \times 8\text{-bits}$

address lines = 19

data lines = 8

power = 1

ground = 1

29

05. Ans: (d)

Sol: All are hardware solutions for branch difficulty. One software solution also possible which is "delayed branch" provided by compiler.

06. Ans: (b)

07. Ans: (b)

Sol: CPU goes for interrupt service only after completing current instruction execution. But DMA service can be performed even when the current instruction execution has not completed.

08. Ans: (a)

Sol: One instruction execution is performed by one instruction cycle, which contains following 6 phases:

1. Instruction fetch
2. Instruction decode
3. Effective address calculation
4. Operand fetch
5. Execution
6. Write back

09. Ans: (b)

Sol: Auto increment mode is post increment and auto decrement mode is pre decrement.

10. Ans: (d)

11. Ans: (d)

Sol: Most of the operating systems ignore the deadlocks all together and pretends that deadlocks never occur in the system including unix.

12. Ans: (d)

Sol: Option (a) will not initialize array. It is just declaration of array. So array elements will have garbage values.

13. Ans: (d)

Sol: The while loop will run infinite times because there is a semicolon(;) at the end of while statement. So any print but only infinite loop.

14. Ans: (c)

15. Ans: (b)

Sol: Pointer of any type occupies 2 Bytes.

Hence * p $\Rightarrow$2B

* fp[10] $\Rightarrow$ 10*2B = 20B

char x $\Rightarrow$ 1B

Total $\Rightarrow$ 2 + 20 +1 = 23B

16. Ans: (a)

Sol: $1\text{ chip capacity} = \dfrac{\text{Total capacity}}{\text{number of chips}}$

$= \dfrac{256\,\text{MB}}{16}$

$$= \frac{2^{26}\,B}{2^{4}}$$
$$= 2^{22}\,B$$

Byte addressable chip,

hence chip memory $\Rightarrow 2^{22}\times 1B$

address $\Rightarrow$ 22-bits

17. Ans: (c)
Sol: DMA is used for data transfer between memory & I/O

18. Ans: (a)
Sol: Opcode is mandatory field in every instruction

19. Ans: (d)
Sol: In Real time system OS provides deadline to every process and process should execute within deadline itself.

20. Ans: (d)
Sol: The schedule is strict and every strict schedule is both recoverable and cascadeless

21. Ans: (a)

22. Ans: (b)
Sol: Definition of printf() and scanf() functions are given in header file stdio.h. So if these functions are used in program then we will have to include this header file.

23. Ans: (d)
Sol: For structure variable dot(.) is used ; but for structure pointer arrow (→) is used

24. Ans: (c)
Sol: 1 block is transferred when there is a miss in cache.

25. Ans: (b)
Sol: a = b is assignment operation and if condition will be true.
Hence a = 3 $\Rightarrow$ a + b $\Rightarrow$ 3 + 3 $\Rightarrow$ 6
To compare a and b, a = = b should be written

26. Ans: (c)
Sol: Relation R is in 3NF but not in BCNF since in D → A ; A is prime attribute but D is not a super key

27. Ans: (b)

28. Ans: (c)
Sol: A & B will return bit-wise AND of A and B.

$A \Rightarrow 5 \Rightarrow 101$
$B \Rightarrow 6 \Rightarrow 110$
$100 \Rightarrow 4$

29. Ans: (d)
Sol: All statements are valid.

30. Ans: (c)
Sol: All the instructions supported by a system are collectively known as instruction set.

31. Ans: (d)
Sol: All are independent transactions operating on different dataitems then it is equivalent to all possible serial schedules with T_1, T_2, T_3

32. Ans: (a)

33. Ans: (a)
Sol: System call provides interface between user and OS facilities.

34. Ans: (a)
Sol: Memory size $= 2^{16} \times 8$ bits
$= 2^{16} \times 1B$
$= 64$ KB

35. Ans: (b)
Sol: $30 = H \times 10 + (1 - H)(10 + 200)$
$30 = 10H + 210 - 210H$
$200H = 180$
$H = 0.9$
$= 90\%$

36. Ans: (b)

37. Ans: (a)

38. Ans: (b)

39. Ans: (a)

40. Ans: (c)
Sol: NAT (Temporary Solution) & IPv_6 (Permanent Solution)

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41. Ans: (b)

Sol: $G(x) = x^3 + 1$

Divisor $\Rightarrow$ 1001

```
1001) 1 1 0 1 1 0 1 0 0 0
      1 0 0 1 :
        1 0 0 1
        1 0 0 1
              1 0 0 0
              1 0 0 1
                0 0 1
```

42. Ans: (b)

Sol: $T_t \geq 2T_P$

T_P = Distance + signal speed

= 100 km × 50 ms/km = 5000 ms

$$\frac{\text{Frame size}}{\text{DTR}} >= 2 \times 5000\,\text{ms}$$

Minimum frame size = 10000 ms × DTR

= 10^4 ms × 1 kbps = 10^4 ms × 10^3 bits/sec

= 10^4 bits = 1250 bytes

43. Ans: (c)

Sol: $T_t = \dfrac{\text{Frame size}}{\text{DTR}} = \dfrac{50\,\text{bytes}}{1\,\text{kbps}} = 400\,\text{ms}$

T_P = 200 ms

$$\eta_{\text{stop \& wait}} = \frac{T_t}{T_t + 2T_p}$$

$$= \frac{400\,\text{ms}}{400\,\text{ms} + 2 \times 200\,\text{ms}}$$

$$= \frac{1}{2}$$

44. Ans: (b)

45. Ans: (c)

Sol: To generate digital signature, sender uses its own private key.

46. Ans: (c)

Sol: CRC & Checksum are error detection technique only.

Hamming code is error detection and correction technique.

47. Ans: (b)

Sol:
- Sender uses receiver public key for encryption $k_e \Rightarrow (e, n) = (3, 33)$
- For encryption $C = (M)^e \bmod(n)$

$= (9)^3 \bmod (33)$

$= (729) \bmod (33)$

$= 3$

$\therefore C = 3$

48. Ans: (c)

Sol: The sampling rate = $\frac{1}{T_s} = 8000$

Duration of the frame is equal to the sampling interval

$\frac{1}{T_s} = 8000$

$T_s = 125\mu sec$

49. Ans: (a)

Sol: $EIRP = 10\log_{10}(P_tG_t)$

$= (P_t)dB + (G_t)dB$

$40dB = (10dB) + (G_t)dB$

$(G_t)dB = 40dB - 10dB = 30dB = 10^3 = 1000$

50. Ans: (a)

Sol: Received power

$$P_r = \frac{P_tG_tA_e}{4\pi r^2} = \frac{P_tG_tG_r\lambda^2}{(4\pi r)^2} = \frac{(EIRP)G_r}{\left[\frac{4\pi r}{\lambda}\right]^2}$$

$$(P_r)_{dB} = (EIRP)_{dB} + (G_r)_{dB} - 20\log\left[\frac{4\pi r}{\lambda}\right]$$

$$\text{path loss} = 20\log\left[\frac{4\pi r}{\lambda}\right] = 20\log\left[\frac{4\pi rf}{c}\right]$$

$\Rightarrow$ pass loss depends upon frequency and distance

51. Ans: (a)

Sol: Given that $\left(\frac{C}{N}\right) = 15dB$

& $N = -104dBm = -134dB$

We know that,

$$(C)_{dB} = \left(\frac{C}{N}\right)_{dB} + (N)_{dB}$$

$= 15 - 134 = -119\text{dB}$

$(P_t)_{dB} = (G_s)_{dB} + (C)_{dB}$

$= 112\text{dB} - 119\text{dB} = -7\text{dB}$

$= -7 + 30 = 23\text{dBm}$

52. Ans: (b)

Sol: (i) Geostationary satellite will appear stationary with respective to a place. so, tracking is not required.

(ii) Angular velocity between satellite and earth is same. Relative velocity difference is zero. So, doppler effect is negligible.

(iii) Path losses are directly proportional to the frequency and distance, both are very high so the losses are very high

(iv) Satellite takes 24hours to complete one revolution
Earth also takes 24hours to complete one revolution
So, angular velocity is same

53. Ans: (d)

Sol: Transmitted power $P_t = 0\text{dBm} = -30\text{dB}$

Total losses $= 0.5\text{dB/km} \times 10\text{km} = 5\text{dB}$

Received power = P_t – total losses $= -30\text{dB} - 5\text{dB} = -35\text{dB}$

54. Ans: (a)

Sol: Given that a = 15000km, e = 0.1

Radius of apogee $r_A = a(1+e) = 15000(1 + 0.1) = 1.1 \times 15000 = 16500$ km

The height of apogee is $(r_A - 6371)\text{km} \approx 16500 - 6370 = 10130$ km

55. Ans: (c)

Sol: Path loss $L_p = 92.4 + 20\log f\,(\text{GHz}) + 20\log_{10} D$

$= 92.4 + 20\log_{10}10 + 20\log_{10}100$

$= 92.4 + 20 + 40$

$= 152.4\text{dB}$

56. Ans: (c)

Sol: Transmitted power = 0dB = 1W

Total losses = $40\text{dB} = 10^4$

Due to losses the signal strength decreases by a factor of 10^4

So received power = $\frac{1}{10^4} = 10^{-4} = 0.1\text{mW}$

57. Ans: (b)

Sol: Receiver sensitivity S = $\frac{\text{Received power}}{\text{Bit rate}}$

So, received power = sensitivity × Bit rate

Received power = $0.1\times10^{-9}\times10\times10^6 = 1\times10^{-3} = 1\text{mW}$

Received power = $10\log_{10}(1\times10^{-3})$

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58. Ans: (d)

Sol: In a microwave link ring around condition occur if the received frequency and transmitted frequency are same.

59. Ans: (c)

Sol: $(P_r)dB = (EIRP)dB + (G_r)dB - (L_p)dB = 43 + 53 - 136 = 96 - 136 = -20dB = 10^{-2} = 10mW$

60. Ans: (c)

Sol: No. of nodes (n) = 10

Total Single Stuck at Faults = 2n = 20

Number of detectable faults = 20–6 = 14

$$\text{Fault coverage} = \frac{\text{Number of detectable faults}}{\text{total no.of faults}} = \frac{14}{20} = 70\%$$

61. Ans: (a)

Sol: Channel stopper implementation is done before growing the field oxide. Channel stopper implant increases the threshold voltages of channel under FOX.

62. Ans: (d)

Sol: Partial scan doesn't cover all flip-flops in the design, so sequential ATPG is required.
Boundary scan in used only at board level.

63. Ans: (a)

Sol: Thermodynamic stability of metal-dielectric interface at processing temperature are major concern in VLSI processing. If the temperature increased beyond 500^0C, aluminium start penetrating the silicon substrate and act as p-type impurity. Copper causes a lot of trap generation when used as gate material.

64. Ans: (c)

Sol: In NMOS, conduction is mainly due to electrons and in PMOS conduction is due to holes

$\mu_{n,si}$= 1300 cm^2/V-sec

$\mu_{p,si}$ = 500 cm^2/V-sec

So, higher the mobility, faster is the switching. And NMOS requires far lesser area than PMOS.

(**NOTE:** frequency of operation of any electronic device mainly depends on mobility)

65. Ans: (c)

66. Ans: (c)

Sol: Thinox mask is used immediately after well definition and this patterns the SiO_2 layer to expose the active region of the transistor.

67. Ans: (a)

Sol: Both statement (I) and statement (II) are individually true and statement (II) is the correct explanation of statement (I)

68. Ans: (a)

Sol: In vectored interrupt CPU receives address of ISR (Interrupt Service Routine) along with interrupt signal from device. Hence, the CPU directly can branch to ISR and can execute it.

69. Ans: (a)

Sol: Both statement (I) and statement (II) are individually true and statement (II) is the correct explanation of statement (I).

70. Ans: (a)

Sol: For Program data relocation in base register mode, new base address will be updated in base register hence no need to change in code.

71. Ans: (b)

Sol: Both the statements are definitions of external fragmentation & Internal fragmentation.

72. Ans: (a)

Sol: Both statement I & II are individually true and statement II is correct explanation of statement I.

73. Ans: (d)

Sol: In a satellite, the down link frequency is less than uplink frequency.
Path loss in a microwave link is directly proportional to the frequency.
So, statement I is false, Statement II is true.

74. Ans: (a)

75. Ans: (a)

Sol: The carrier to noise ratio of a earth station receiver is,

$$\frac{C}{N} = (P_t G_t)dB + \left(\frac{G_r}{T_e}\right)dB + (L_p)dB - (B)dB$$

In the above equation $\left(\frac{G_r}{T_e}\right)$ is called as the figure of merit. If the figure of merit is more, $\frac{C}{N}$ will be more. So, the noise performance depends on $\left(\frac{G_r}{T_e}\right)$.

The gain of the receiving antenna and noise temperature are the only parameters, which can be controlled at the earth station. The remaining parameters can't be varied at earth station.

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