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ESE- 2020 (Prelims) - Offline Test Series Test- 11

ELECTRONICS & TELECOMMUNICATION ENGINEERING

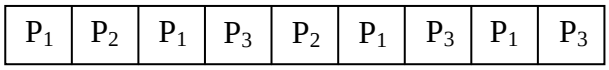
SUBJECT: COMPUTER ORGANIZATION & ARCHITECTURE, ADVANCED COMMUNICATION & ADVANCED ELECTRONICS

- SOLUTIONS

01. Ans: (c)

02. Ans: (d)

Sol: Ready Queue → $P_1\ P_2\ P_1\ P_3\ P_2\ P_1\ P_3\ P_1\ P_3$



0 2 4 6 8 10 12 14 16 17

Process	Arrival time	Burst Time	Finish Time	Turn round time =F.T – A.T	Waiting time =TAT– Burst time
P_1	0	8	16	16 – 0 = 16	16 – 8 = 8
P_2	1	4	10	10 – 1 = 9	9 – 4 = 5
P_3	3	5	17	17 – 3 = 14	14 – 5 = 9

$$\text{Average waiting time} = \frac{8+5+9}{3} = \frac{22}{3} = 7.33.$$

03. Ans: (b)

04. Ans: (b)

Sol: Banker's algorithm is used in Deadlock Avoidance Technology

05. Ans: (a)

Sol:

$$\underbrace{1,2,3,.....19,\ 20}_{\text{Page fault}}\ \underbrace{20,19,18}_{\text{page hit}}\ \underbrace{17,....3,\ 2,\ 1}_{\text{page fault}}$$

Number of page faults = 37.

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06. Ans: (d)
Sol: Only one process should be allowed in critical section at a time to avoid race condition.

07. Ans: (c)
Sol: In implied Addressing Mode Instruction; the operand is implicit.
Ex: HLT
NOP

08. Ans: (c)
Sol: Except for Strict Alternation remaining suffers from Bounded Waiting.

09. Ans: (c)
Sol: By increasing associativity, the number of conflict misses in cache can be reduced

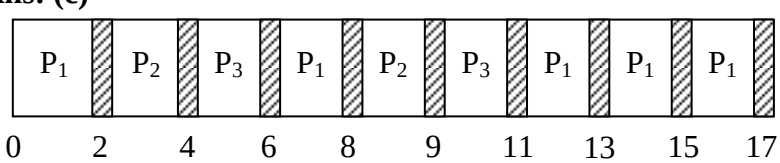
10. Ans: (d)
Sol: Maximum average turn around time leads by Round Robin.

11. Ans: (b)
Sol: $h_b = 0.8$, $t_b = 2$ ns, $t_m = 10$ ns, $n = 3$
$EAT = h_b \times (t_b + t_m) + (1 - h_b) \times (t_b + (n+1)t_m)$
$= 0.8 \times 12$ ns $+ 0.2 \times 42$ ns
$= 9.6$ ns $+ 8.4$ ns $= 18$ ns

12. Ans: (c)
Sol: Minimum instance of
$R = (5 - 1) + (4 - 1) + (6 - 1) + 1 = 13$

13. Ans: (b)

14. Ans: (c)
Sol:



Number of context switches = 8

15. Ans: (b)

Sol: $h_b = 0.8$, $t_b = 2$ns, $t_m = 10$ns, $N = 2$, $P = \frac{1}{10^5}$

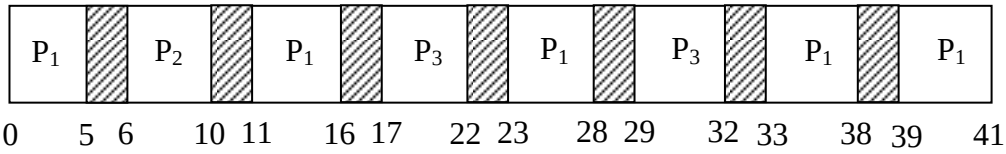
$EAT = h_b * (t_b + t_m) + (1 - h_b) * [(1 - P) * (t_b + (N + 1) * t_m) + P*$ service time$]$

$= 0.8 * (2 + 10)$ ns $+ 0.2 * [\left(1 - \frac{1}{10^5}\right) * (2 + 3*10)$ ns $+ \frac{1}{10^5} * 10 * 10^6$ ns$]$

$= 9.6$ns $+ 0.2* (131.99968)$
$= 35.999936$ ns

16. Ans: (c)

Sol:



TAT = Finish time – Arrival time

$P_1 = 41 - 0 = 41$

$P_2 = 10 - 3 = 7$

$P_3 = 32 - 7 = 25$

$$\text{Average TAT} = \frac{41+7+25}{3} = \frac{73}{3} = 24.33$$

17. Ans: (c)

Sol: Offset ⇒ 7bits, page no. ⇒ 12 – 7 = 5 bits

ABC ⇒ ㉑, 7A4 ⇒ ⑮, A5A ⇒ ⑳,

ACD ⇒ ㉑, 75C ⇒ ⑦, 7B3 ⇒ ⑮,

5AC ⇒ ⑪, A2D ⇒ ⑳, 5BD ⇒ ⑪.

			✓		✓		✓	✓
21,	15,	20,	21,	7,	15	11,	20,	11

21	21 15	21 15 20		7 15 20		7 11 20

18. Ans: (c)

Sol: Cache hit ratio is high because of spatial and temporal locality of reference.

19. Ans: (a)

20. Ans: (a)

Sol: Replacement policy does not apply on direct mapped cache organization.

21. Ans: (b) **22. Ans: (b)**

23. Ans: (b)

Sol: fun(4) → fun(3) → fun(2) → fun(1) → fun(0)

print 4 ← print 3 ← print 2 ← print 1 ← return

24. Ans: (b)

Sol: It swap the values.

25. Ans: (b)

Sol: i = 0 ⇒ (5), i = 1 ⇒ (4), i = 2 ⇒ (3), i = 3 ⇒ (2), i = 4 ⇒ (1)

Ans = 5 + 4 + 3 + 2 + 1 = 15

26. Ans: (a)

Sol: DMA controller steals the bus service when buses are not used by the system only.

27. Ans: (a)

Sol: → In LRU, Hit rate is excellent but Hardware design cost is more expensive.

→ Hit rate of optimal is closer to LRU

→ In FIFO, Hit rate is poor but design cost is also cheap.

28. Ans: (c)

Sol: In C programming language 'sizeof' is considered as an operator

29. Ans: (c)

Sol: Maximum size of virtual memory = Size of disk

30. Ans: (b)

Sol: Return type of printf function is integer and value of this integer is exactly equal to number of characters including white space,

printf function prints. So, printf("Hello world") will return 11.

31. Ans: (c)
Sol: Compiler is accessed by user directly and need not be the part of an OS.

32. Ans: (b)
Sol: Segmentation suffers from external fragmentation & the essential content in page table entry is frame number.

33. Ans: (b)

34. Ans: (b)

35. Ans: (a)
Sol: Here,
m = number of rows = 2
n = number of columns = 3
* (A[0] + 0) = A [0] [0] = 10
* (A[1] + 0) = A [1] [0] = 13
Similarly all the elements are accessed
$\therefore$ 10 13 11 14 12 15 is the output

36. Ans (a)
Sol:
- Each variable type takes different amount of memory. So, void pointers can't be used for dereferencing
- Arithmetic operations can't be performed as compiler cannot know after how many bytes next variable is located
- An extern value can be declared many times, but can be initialized only once.

37. Ans: (a)
Sol: The candidate keys are
F, AB, CB

38. Ans: (c)
Sol: The query that returns infinite number of rows is said to be an unsafe query.

39. Ans: (c)
Sol: Candidate keys are A and C. A relation is in BCNF if every LHS of a FD is either candidate or super key.

40. Ans: (d)
Sol: BC → CD is a transitive dependency

41. Ans: (b)

42. Ans: (b)
Sol: Dependency preserving decomposition is not always possible for R.

43. Ans: (b)
Sol: Descriptive attributes are used to Record information about relationships

44. Ans: (c)
Sol: In dense index, index record is created on every key value. Secondary index requires index entry on every key value.

45. Ans: (d)
Sol: Preamble - It is used for synchronization purpose which alerts receiving stations that a frame is coming.

46. Ans: (a)
Sol: AND 220.10 . 11 .144
255.255.255.224
Base ID 220.10 . 11 .128

144: 1001 0000
224: 1110 0000
128: 1000 0000

IP address of first host = Base ID + 1
= .128 + 1
= .129

47. Ans: (b)
Sol: Data + Header size in datagram ≤ MTU
Three fragments 1360, 1360, 280 bytes
With MF(1, 1, 0)
Offset(0, 1360/8, 170 + 170)
= 170 = 340

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48. Ans: (b)

Sol: Number of nodes = N = 7

Number of links = ${}^{N}C_2 = {}^{7}C_2 = 21$

49. Ans: (c)

Sol: TCP is preferred over UDP because it provides Reliable and Connection oriented service.

50. Ans: (c)

Sol: $P = (c)^d \bmod (n) = (6)^7 \bmod (77)$

$= 41$

51. Ans: (c)

Sol: (a) 127 is used for loop back addressing i.e. inter process communication

(b) 192.248.16.255 it is Direct Broadcast Address

(c) 150.7.0.0 it represents the Network id of the Network.

52. Ans: (b)

Sol: Number of hosts N = 3

Each host transmitting probability P = 0.8

Probability that only one host can transmit in an idle slot (throughput of channel)

$= N * P * (1 - P)^{(N-1)}$

$= 3 \times 0.8 \times (0.2)^{(3-1)}$

$= 0.096$

53. Ans: (d)

Sol: Offset is 0 for the first fragment

Offset 200 means there are 200 fragments before this 8 bytes for each fragment 1600 bytes.

54. Ans: (c)

Sol: 128.56.24.0 $\Rightarrow$ 0001 1000

128.56.25.0 $\Rightarrow$ 0001 1001

128.56.26.0 $\Rightarrow$ 0001 1010

128.56.27.0 $\Rightarrow$ 0001 1011

8 + 8 + 6 = 22

Resulting prefix 128.56.24.0/22

55. Ans: (d)

Sol: Under class A {10.0.0.0 to 10.255.255.255}, Any address within this range belongs to private.

56. Ans: (c)

Sol: The top 4 layers: TL, SL, PL and AL

The bottom 3 layers in the communication subnet are physical layer, data link layer and network layer.

57. Ans: (d)

Sol: In microwave frequency range, communication is neither possible through ionosphere (the signal penetrates the ionosphere) nor through earth's surface (very high attenuation at such frequencies.

$\rightarrow$ Due to curvature of earth, the maximum permissible distance between transmitter and receiver is 50km.

58. Ans: (c)

Sol: Apogee : Largest radius of the elliptical orbit

Perigee : Smallest radius of the elliptical orbit.

first man-made satellite sputnik-1 launched by The Soviet Union in 1957

59. Ans: (b)

Sol: Transponder consists of a receiving antenna whose frequency is equal to uplink frequency and transmitting antenna whose frequency is equal to downlink frequency.

$\rightarrow$ There are 4 domains that are used for achieving multiple access, namely frequency, time, code and space.

60. Ans: (b)

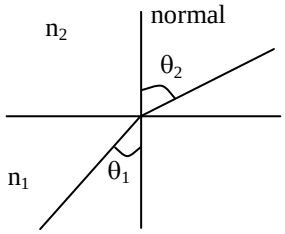
Sol: The losses offered by fibre cable are too small compared to copper cable and radio links.

Typical comparative loss values are:

Copper = 50 dB/km, satellite = 20dB/km, optical = 0.1 dB/km.

61. Ans: (d)

Sol: → Angles are always taken with respective to the normal, Therefore,



$n_1\sin\theta_1 = n_2\sin\theta_2$

$$\rightarrow \alpha = \frac{10\log_{10}\left(\frac{P_{in}}{P_{out}}\right)}{L}$$

62. Ans: (c)

Sol: → Dark current is in the order of nA.

→ LASERs have a shorter life time than LEDs because of their high operating power.

63. Ans: (c)

Sol: $$\text{Propagation time} = \frac{2\times \text{distance between earth and geo-stationary satellite}}{\text{Velocity of light in vaccum}}$$

$$= \frac{2\times 36000\,\text{km}}{3\times 10^8\,\text{m/sec}} \cong 300\,\text{ms}$$

64. Ans: (c)

Sol: The microwave frequency bands are

L – band	–	1GHz	→ 2GHz
S – band	–	2GHz	→ 4GHz
C – band	–	4GHz	→ 8GHz
X – band	–	8GHz	→ 12GHz
Ku– band	–	12GHz	→ 18GHz
K – band	–	18GHz	→ 24GHz
Ka – band	–	24GHz	→ 30GHz

65. Ans: (d)

Sol: Skip distance, $d_{skip} = 2h\sqrt{\left(\frac{f_{muf}}{f_{CR}}\right)^2 - 1}$

h: height at which reflection occurs

f_{muf} : maximum useable frequency

f_{CR} : Critical frequency of layer of ionosphere

66. Ans: (c)

Sol: Considering obliqueness of the earth

The maximum possible link distance

$d \approx 4.12\left(\sqrt{h_t} + \sqrt{h_r}\right)$

Where h_t, h_r in meters and 'd' in kilometer

$d \approx 4.12\left(\sqrt{200} + \sqrt{80}\right)$

$d \approx 4.12\ (14.14+9) \approx 96$ km

67. Ans: (b)

Sol: $\text{Fault coverage} = \dfrac{\text{Number of detectable faults}}{\text{Total number of faults possible in the circuit}}$

$\rightarrow$ Total number of faults possible is '2n' for 'n' nodes because at every node of the circuit, 2 stuck-at-faults are possible.

$\rightarrow$ Number of detectable faults = Total faults possible in the circuit
– Number of non-detectable faults
= 20 – 6 = 14

$\rightarrow$ fault coverage $= \dfrac{14}{20} = 70\%$

68. Ans: (d)

Sol: To generate a stuck at fault at a node, the node must be both 0 and 1 controllable
To propagate a stuck at fault at a node, that node must be observable.

69. Ans: (a)

Sol: TPI is an Ad hoc DFT technique used for improving the controllability and observability of internal nodes

70. Ans: (d)

Sol: Sequential circuits have poor controllability and observability i.e., sequential circuits are difficult to test.

71. Ans: (b)

Sol: Optical fibres have broader bandwidth compared to conventional copper and coaxial cables. In single mode optical fibres, Rayleigh scattering serves as the dominant mechanism for optical loss because of exponential increasing bandwidth demand.
Thus, both the statements are true and statement (II) is not the reason for statement (I).

72. Ans: (d)

Sol: In a satellite transponder LNA (Low Noise Amplifier) is must thus statement (I) is wrong.

73. Ans: (a)

Sol: High fault coverage needs to be achieved for a circuit. So, Statement (I) is true

The lower the fault coverage, the higher the chance of handling over a detective piece to the customer. So, Statement (II) is true

Statement I and Statement II are correct and Statement II is the reason for Statement I.

74. Ans: (A)

Sol: In linked file allocation the directory entry of file contains a pointer to starting and ending file block only. Each block contains a pointer to the next block occupied by the file. Hence only sequential access is possible.

75. Ans: (C)

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