Q. No	QUESTION	OPTION A	OPTION B	OPTION C	OPTION D	CORRECT ANSWER
1	A system with 10 sensors each generating 50 bytes per second produces how much total data per second?	0.25 KB	0.5 KB	0.75 KB	1 KB	0.5 KB
2	Two modules each take 6 ms to execute, and a communication delay of 3 ms occurs between them. What is total system delay?	12 ms	13 ms	14 ms	15 ms	15 ms
3	A processor executes 1 million instructions per second. If each task requires 5000 instructions, how many tasks can run per second?	100	150	200	250	200
4	A node transmits 1000 frames per second on a 500 kbps CAN bus, each 100 bits long. What is bus load?	10%	15%	20%	25%	20%
5	A CAN bus error rate is 2%. If 1000 messages are sent, how many are retransmitted?	10	15	20	25	20
6	A CAN-FD network operates at 2 Mbps for data phase. If each message takes 200 μs, how many messages per second can be sent?	4000	4500	5000	6000	5000
7	A smart light consumes 10 W and operates for 8 hours per day. What is its daily energy consumption?	0.04 kWh	0.06 kWh	0.08 kWh	0.10 kWh	0.08 kWh

8	If a Wi-Fi light switch responds in 50 ms and a gateway adds 20 ms latency, what is total response delay?	60 ms	65 ms	70 ms	75 ms	70 ms
9	A lighting controller sends 50 commands per minute, each 10 bytes. What is data throughput?	5 B/s	8 B/s	10 B/s	12 B/s	8 B/s
10	A home automation hub manages 8 devices with 500 ms switching delay each. What is the total time to update all devices?	2 s	3 s	4 s	5 s	4 s
11	A motion detector sends 3 alerts per hour, each 32 bytes. How much data is sent per day?	1 KB	2 KB	2.25 KB	2.5 KB	2.25 KB
12	In a smart lighting network, each lamp consumes 0.5 W in idle mode and 10 W when active. If lamps are active 10% of the time, what is average power?	1 W	1.45 W	1.95 W	2 W	1.95 W
13	A Zigbee network has 15 nodes, each sending 128-bit messages at 100 bps. What is total load on the network?	10%	12%	13%	15%	12%
14	A luxury vehicle has 5 CAN buses at 500 kbps each. If total data rate is 1 Mbps, what is average load per bus?	30%	35%	40%	45%	40%
15	A body control ECU sends 50 messages of 64 bits each per second. What is its contribution to a 500 kbps bus load?	0.5%	0.6%	0.7%	0.8%	0.6%

16	A high-speed CAN bus operates at 1 Mbps. What is the maximum number of 128-bit frames per second that can be transmitted?	5000	6000	7000	8000	7000
17	The gateway ECU handles 8 buses, each with 1000 frames/s. What is total frame processing rate?	6000	7000	8000	9000	8000
18	A luxury sedan's CAN backbone uses dual redundant buses. If each bus has reliability of 0.98, what is combined system reliability?	0.99	0.999	0.996	0.992	0.999
19	If the infotainment ECU sends 2 Mbps data over a 1 Mbps CAN, what compression ratio is required to transmit in real time?	1.5:1	2:1	3:1	4:1	2:1
20	A high-end SUV has 60 ECUs divided across 5 buses. How many ECUs per bus on average?	10	11	12	13	12
21	The vehicle's safety ECU communicates on a fault-tolerant CAN (FT-CAN). If the bus fails once every 10^6 cycles, what is reliability percentage?	99.90%	99.95%	99.99%	99.999%	
22	A gateway transmits 1.2 million bits per second across a 1 Mbps bus. What is percentage overload?	10%	15%	18%	20%	
23	A luxury car uses FlexRay alongside CAN. If CAN speed is 1 Mbps and FlexRay 10 Mbps, what is relative speed ratio?	8:1	9:1	10:1	12:1	

24	A basic embedded controller executes 100 instructions per ms. How many instructions in 1 s?	10,000	50,000	100,000	1,000,000
25	A sensor node sends 200 bytes/sec. Total data in 1 hour = ?	72 KB	720 KB	1.44 MB	2 MB
26	If an automotive embedded system has 50 ECUs, and each consumes 2 W, total power = ?	50 W	75 W	100 W	120 W
27	Industrial embedded system monitors 10 sensors, each 16-bit, sampled 1 kHz. Total bits/sec = ?	10 kbps	160 kbps	256 kbps	320 kbps
28	Automotive ECU reaction time = 10 ms, new SoC reduces by 40%. New reaction time = ?	6 ms	7 ms	8 ms	9 ms
29	Industry 4.0 edge device processes 500 events/sec, each 10 ms processing. CPU utilization = ?	40%	50%	60%	70%
30	Embedded system handles 500 interrupts/sec. Each interrupt 10 µs. CPU utilization = ?	0.5%	1%	2%	5%
31	Embedded system in smart home sends 50 packets/hr, 128 bytes each. Total data/day = ?	0.1 MB	0.15 MB	0.2 MB	0.25 MB
32	A microcontroller runs at 50 MHz clock. Calculate how many clock cycles occur in one second.	5×10^6	50×10^6	500×10^6	5×10^9
33	A complex embedded system has 5 MCUs, each running at 20 MHz. Determine the total combined cycles per second.	50 MHz	80 MHz	100 MHz	120 MHz

34	An ALU executes 2 operations per clock cycle at 100 MHz. Compute total operations executed per second.	100 M	150 M	200 M	250 M	
35	A microcontroller has 64 KB RAM, with 32 KB already used. Calculate the free RAM available.	16 KB	32 KB	48 KB	64 KB	
36	A complex system uses 3 CPUs running at 200 MHz, 250 MHz, 300 MHz. Find the average CPU clock frequency.	233 MHz	250 MHz	266 MHz	280 MHz	
37	A microcontroller consumes 50 mA current at 3.3 V. Compute the power consumption.	165 mW	150 mW	200 mW	175 mW	
38	An MCU has a 12-bit ADC with input range 0–5 V. Calculate the voltage step size of the ADC.	0.61 mV	1.22 mV	0.5 mV	0.25 mV	
39	Microcontroller ADC 10-bit, input 0–3.3 V. Compute ADC voltage step size.	0.0032 V	0.00032 V	0.00033 V	0.003 V	
40	MCU executes 100 instructions, each 2 cycles, clock 20 MHz. Total execution time = ?	5 µs	10 µs	20 µs	25 µs	
41	Hardware-software partition: 40% hardware, 60% software. Total cycle time = 10 ms. Find software execution time.	4 ms	5 ms	6 ms	7 ms	6 ms
42	Verification test: 500 test cases, 10% fail. Calculate the number of failed test cases.	40	50	60	70	50

43	Requirement analysis: 20 functions, 5 are critical. Calculate the percentage of critical functions.	20%	25%	30%	35%	25%
44	Firmware update = 256 KB, flash write speed = 128 KB/s. Compute update time.	1 s	2 s	3 s	4 s	2 s
45	Validation test: 1000 data points, 5% outside tolerance. Find number of out-of-tolerance points.	40	50	60	70	50
46	Memory fragmentation: Total = 512 KB, used = 380 KB. Compute fragmentation percentage.	20%	25%	30%	35%	25%
47	MCU instruction takes 4 cycles, clock = 25 MHz. Compute instruction time.	100 ns	120 ns	140 ns	160 ns	160 ns
48	Hardware-software partition: Software = 8 ms, hardware = 2 ms. Compute software % of cycle.	70%	75%	80%	85%	80%
49	Embedded system requirement: Max response 10 ms, task = 7 ms. Compute time margin.	2 ms	3 ms	4 ms	5 ms	3 ms
50	Moore machine contains 3 states. Each state produces a 2-bit output. Calculate **total number of output combinations** possible.	4	6	8	12	8
51	Mealy machine has 3 states, 2 inputs, and 2 outputs. Compute the **maximum possible transitions** the machine can have.	6	8	12	16	12

52	FSM executes with a cycle time of 5 ms. The system runs at 1000 cycles per second. Find the **total execution time per second**.	0.5 s	1 s	5 s	10 s	5 s
53	UML diagram contains 10 classes. Each class has 3 associations. Compute **total number of associations** in the system.	20	25	30	33	30
54	Mealy machine has 4 states, 2 inputs, and 2 outputs. Determine **total possible output patterns**.	8	12	16	20	16
55	Moore machine contains 6 states. Each state outputs 2 bits. Calculate the **total output combinations possible**.	12	16	32	64	64
56	UML diagram contains 5 classes. Each class has 2 inheritances. Compute **total inheritance links** in the system.	5	8	10	12	10
57	In data flow, Task A produces 5 KB/sec. Data is consumed by 2 tasks. Determine **average data per consuming task**.	1 KB	2.5 KB	3 KB	5 KB	2.5 KB
58	UML sequence diagram has 5 objects. Each object sends 3 messages. Find **total number of messages exchanged**.	10	12	15	18	15
59	Formal verification checks 200 properties. 10% of them fail. Determine **number of failing properties**.	15	20	25	30	20

60	A real-time task must complete in 8 ms but currently takes 10 ms. By what percentage must its execution time be reduced?	10%	15%	20%	25%	20%
61	A system executes three sequential tasks taking 3 ms, 5 ms, and 7 ms respectively. What is the total execution time?	13 ms	14 ms	15 ms	16 ms	15 ms
62	A microcontroller runs at 16 MHz and executes one instruction per cycle. How many instructions are executed in 2 ms?	16,000	32,000	64,000	128,000	32,000
63	An embedded processor consumes 20 mA at 5 V. What is its power consumption?	50 mW	100 mW	150 mW	200 mW	100 mW
64	If a control task runs every 10 ms and takes 2 ms to execute, what is CPU utilization?	10%	15%	20%	25%	20%
65	A data buffer can store 256 bytes. If data arrives at 32 bytes per millisecond, how long before the buffer is full?	6 ms	7 ms	8 ms	9 ms	8 ms
66	If memory access takes 200 ns and instruction fetch takes 100 ns, what is total latency per instruction?	250 ns	300 ns	350 ns	400 ns	300 ns

67	A design improvement reduces execution time from 12 ms to 9 ms. What is the percentage improvement?	15%	20%	25%	30%	25%
68	An embedded device performs 60 tasks per minute, each taking 600 ms. What is total active time per minute?	30 s	35 s	36 s	40 s	36 s
69	A CAN bus operates at 1 Mbps and transmits frames of 128 bits. What is the frame transmission time?	64 μs	96 μs	128 μs	256 μs	128 μs
70	In a CAN network with 8 nodes, each node sends 200 frames/s of 64 bits. What is total data rate?	64 kbps	80 kbps	100 kbps	120 kbps	100 kbps
71	If arbitration delay is 3 μs and each frame takes 100 μs, what is bus efficiency?	95%	96%	97%	98%	97%
72	A CAN frame includes 8 data bytes, 47 bits overhead, and 15 bits CRC. What is total frame length?	118 bits	126 bits	138 bits	150 bits	126 bits
73	The identifier field in CAN uses 11 bits. How many unique message identifiers are possible?	512	1024	1536	2048	2048
74	The processor executes 1.5 million instructions in 30 ms. What is the instruction rate?	25 MIPS	40 MIPS	50 MIPS	60 MIPS	50 MIPS

75	If a display refresh task runs every 20 ms and each update takes 2 ms, what is CPU idle percentage?	80%	85%	90%	95%	90%
76	A task must execute 500 times per second. What is its period in milliseconds?	1 ms	2 ms	4 ms	5 ms	2 ms
77	A system has three tasks with execution times 2 ms, 3 ms, and 5 ms and periods 10 ms each. What is total CPU utilization?	60%	70%	80%	90%	100%
78	GPS update interval is 2 s. Train speed is 1 m/s. Determine the **distance traveled between updates**.	1 m	2 m	3 m	4 m	2 m
79	Train motor operates at 12 V, 1.5 A, with 80% efficiency. Calculate the **mechanical output power**.	16 W	18 W	20 W	22 W	14.4 W (~16 W)
80	Model train has 8 sensors, sampled at 1 kHz with 12-bit resolution. Compute the **total data generated per second**.	96 kbps	128 kbps	192 kbps	256 kbps	96 kbps
81	A model train motor operates at 12 V and draws 2 A of current. Calculate the **power consumption** of the motor in watts.	12 W	18 W	24 W	30 W	24 W

82	A track segment is 50 m long. The train travels at a speed of 10 m/s. Determine the **time required to cross the segment**.	3 s	4 s	5 s	6 s	5 s
83	The train controller samples sensors at 1 kHz. Each task execution takes 200 μs. Compute the **CPU utilization percentage**.	15%	20%	25%	30%	20%
84	A GPS device updates its position every 1 second. Over a duration of 1 hour, calculate the **total number of position samples** collected.	3600	3000	4000	5000	3600
85	The train accelerates at 0.5 m/s². Find the **time taken to reach a speed of 10 m/s**.	10 s	15 s	20 s	25 s	20 s
86	Model train has 4 sensors, each 16-bit, sampled at 500 Hz. Determine the **data generated per second in kbps**.	32 kbps	64 kbps	128 kbps	256 kbps	64 kbps
87	GPS position data uses 32 bits for longitude and 32 bits for latitude. Compute the **total position data size in bytes**.	4 bytes	8 bytes	16 bytes	32 bytes	8 bytes
88	Train PWM operates at 20 kHz with 50% duty cycle and 12 V supply. Calculate the **average voltage output**.	6 V	12 V	24 V	30 V	6 V
89	The track length is 100 m, and the train moves at 5 m/s. Find the **travel time to cover the track**.	15 s	18 s	20 s	22 s	20 s
90	GPS logging records 1 sample per second. Over 24 hours, calculate the **total number of samples collected**.	86,400	50,000	100,000	120,000	86,400
91	Train controller executes 3 tasks, each taking 1 ms, with period 10 ms. Compute the **CPU utilization**.	20%	25%	30%	35%	30%

92	Industry 4.0 IoT device uses struct for sensor data {uint8_t id; float temp; uint32_t timestamp;} transmitted every 100ms. Using pragma pack(1) vs natural alignment, annual bandwidth saved for 1000 devices?	1.2 GB	2.5 GB	3.8 GB	5.0 GB	3.8 GB
93	Healthcare wearable monitoring system stores struct patient_vitals{uint32_t timestamp; int16_t ecg_sample; uint8_t hr; uint8_t spo2;} at 256 Hz. Daily storage requirement for continuous monitoring?	18.2 MB	19.7 MB	21.3 MB	22.8 MB	19.7 MB
94	Industrial automation: struct sensor_node{uint16_t node_id; float sensor_data[4]; uint32_t crc;} network with 200 nodes polling every 50ms. Network bandwidth required at 9600 baud (1 byte=10 bits)?	38.4 kbps	76.8 kbps	153.6 kbps	307.2 kbps	76.8 kbps
95	Flash memory wear leveling: struct block_info{uint32_t erase_count; uint8_t status; uint32_t timestamp;} for 1024 blocks. Metadata overhead percentage?	0.9%	1.8%	2.7%	3.6%	0.9%
96	Verification testing: struct test_case{uint32_t id; void(*setup)(void); void(*test)(void); void(*teardown)(void); uint8_t result;} suite on 32-bit. For 500 test cases, memory overhead?	6.5 KB	8.5 KB	10.5 KB	12.5 KB	8.5 KB
97	Component integration: struct peripheral_if{void(*init)(void); int(*read)(uint8_t, size_t); int(*write)(const uint8_t, size_t);	16 bytes	24 bytes	32 bytes	40 bytes	32 bytes

	void(*deinit)(void);} abstraction layer. VTable overhead on 64-bit?					
98	Software test: 200 modules, each with 10 test cases. Compute total number of tests.	2000	2500	3000	3500	2000
99	Sensor sampling: 1 kHz, 8-bit, 4 sensors. Compute total bits/sec.	4 kbps	8 kbps	32 kbps	64 kbps	32 kbps
100	During the concept phase, a team generates 10 design ideas. Only 30% of them are considered feasible. Calculate the **number of feasible ideas**.	2	3	4	5	3