Emerging Trends

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. Machine learning is a part of artificial intelligence in which:
   (a) machines are built only from metal parts
   (b) data is deleted after use
   (c) computers follow only fixed rules typed by people
   (d) computers learn patterns from data and improve with experience

2. Digital objects are laid over the real world seen through a phone camera. Which technology is this?
   (a) augmented reality **(b)** big data
   (c) grid computing **(d)** blockchain

3. Which cloud service model is an online environment for writing, testing and deploying code without managing servers?
   (a) SaaS **(b)** IaaS
   (c) PaaS **(d)** DaaS (Desktop as a Service)

4. A city's cameras produce petabytes of footage every month. Which characteristic of big data does this show?
   (a) volume **(b)** veracity **(c)** variety **(d)** value

5. Which technology does translating a sentence from Hindi to English automatically use?
   (a) IoT **(b)** VR **(c)** NLP **(d)** robotics

6. In a smart building, 32 IoT sensors each send one reading every 15 minutes. How many readings arrive in 6 hours?
   (a) 800 **(b)** 24 **(c)** 768 **(d)** 192

7. A blockchain has blocks numbered 1 to 17. Someone changes the data in block 9. Every later block stores the hash of the one before it. How many blocks, including block 9, no longer match their stored hashes?
   (a) 17 **(b)** 8 **(c)** 9 **(d)** 1

8. A grid computing project splits 4,740 equal tasks among 20 computers, each doing the same number. How many tasks does each computer do?
   (a) 257 **(b)** 20 **(c)** 474 **(d)** 237

Section B — Short answer — 8 × 2 = 16 marks

9. What is artificial intelligence? Give one everyday example.

10. Name the cloud service model (IaaS, PaaS or SaaS): (a) hiring virtual machines to run a school's own website software (b) a service that runs a developer's code and provides its database, without the developer setting up servers

11. Which characteristic of big data (volume, velocity, variety, veracity or value) does each show? (a) A hospital stores text notes, X-ray images and audio recordings together (b) Some survey answers are incomplete or contradict each other

12. 34 weather sensors each send a 128-byte reading every 15 minutes. How many KB of data do they send in a day?

13. Blocks 1 to 5 form a blockchain. Block 4 is tampered with. Which blocks now fail the hash check? Write their numbers separated by commas.

14. Is each AR (augmented reality) or VR (virtual reality)? (a) arrows drawn over the live camera view to guide you through a station (b) a fully simulated science lab you walk around in with a headset (c) a training headset that puts a pilot in a simulated cockpit

15. A company's data doubles every year. It has 5 GB now. How many GB will it have after 2 years?

16. Name the technology: (a) Data sets so large and fast-growing that ordinary tools cannot store or process them (b) Computing resources such as storage and servers are rented over the internet when needed

Section C — Word problems — 4 × 4 = 16 marks

17. Explain machine learning and natural language processing as parts of AI, with an example of each.

18. A smart city fits 1,600 street lights with sensors. Each sends a 256-byte status message every 10 minutes. (a) How many messages does one light send in a day? (b) How many messages arrive from all the lights in a day? (c) How many KB of data is that per day?

19. A blockchain has blocks 1 to 9. (a) If block 2 is changed, how many blocks fail the hash check? (b) If instead block 8 is changed, how many fail? (c) Why does this make the chain hard to tamper with?

20. A research job has 550 equal tasks, each taking 10 minutes on one computer. (a) How many minutes would one computer take for the whole job? (b) In a grid of 10 computers sharing the tasks equally, how many tasks does each do? (c) About how many minutes does the grid take?

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Answer key

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Q	Answer	Working
1	**(d) computers learn patterns from data and improve with experience**	—
2	**(a) augmented reality**	—
3	**(c) PaaS**	—
4	**(a) volume**	—
5	**(c) NLP**	—
6	**(c) 768**	24 readings per sensor × 32 sensors
7	**(c) 9**	blocks 9 to 17
8	**(d) 237**	4,740 ÷ 20
9	**The ability of machines to do tasks that need human-like intelligence, such as recognising speech; e.g. a map app suggesting a faster route.**	—
10	**(a) IaaS; (b) PaaS**	—
11	**(a) variety; (b) veracity**	—
12	**408 KB**	96 readings × 128 bytes × 34 = 417,792 bytes; ÷ 1024
13	**4, 5**	each block holds the previous block's hash, so the change shows up from block 4 onwards
14	**(a) AR; (b) VR; (c) VR**	AR adds to the real view; VR replaces it with a made-up world
15	**20 GB**	5×2^2
16	**(a) big data (b) cloud computing**	—
17	**Machine learning: systems learn from data and improve, e.g. a filter that learns which emails are spam. NLP: computers understand and produce human language, e.g. voice assistants, automatic translation, chatbots.**	—
18	**(a) 144; (b) 230,400; (c) 57,600 KB**	1,440 ÷ 10; × 1,600; × 256 ÷ 1024
19	**(a) 8; (b) 2; (c) changing one block breaks every later link, so the change is easy to detect and every copy of the ledger disagrees with it**	blocks 2–9; blocks 8–9
20	**(a) 5,500; (b) 55; (c) 550**	550 × 10; 550 ÷ 10; × 10

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