

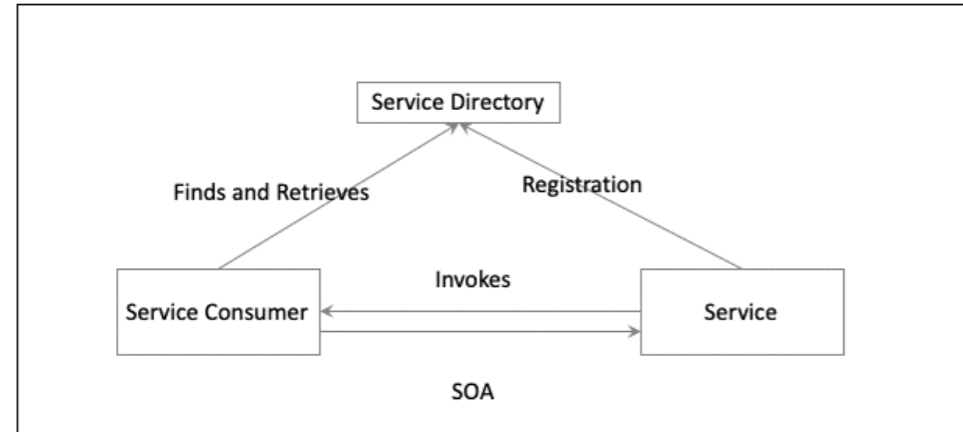
**B5.**

a) Explain the concept of web service.

**(5 marks)**

b) Given the following image, explain what Service Oriented Architecture (SOA) is.

**(4 marks)**



c) What are the features of SOA? Your answer must make reference to Distributed Deployment, Composability, Interoperability and Reusability.

**(8 marks)**

d) What are the core technologies and standards for building interoperability in web services? Your answer must make reference to UDDI, WSDL and SOAP.

**(8 marks)**

**End of Examination**

**BCS THE CHARTERED INSTITUTE FOR IT**

BCS HIGHER EDUCATION QUALIFICATIONS  
BCS Level 6 Professional Graduate Diploma in IT

**NETWORK INFORMATION SYSTEMS**

Wednesday 20th April 2022 – Morning

Answer **any** THREE questions out of FIVE. All questions carry equal marks.

Time: THREE hours

**Answer any Section A questions you attempt in Answer Book A  
Answer any Section B questions you attempt in Answer Book B**

The marks given in brackets are **indicative** of the weight given to each part of the question.

Calculators are **NOT** allowed in this examination.

**Section A**  
**Answer Section A questions in Answer Book A**

**A1.**

Using Secure Sockets Layer/Transport Layer Security (SSL/TLS) as an example implementation:

- a) Describe the function of Public Key Encryption and Symmetric Encryption. In your answer, you should explain why SSL/TLS uses a combination of public key encryption and symmetric encryption. **(9 marks)**
  
- b) Describe the concept of Digital Signature and its role in a Digital Certificate, also explaining the function of the Digital Certificate. **(10 marks)**
  
- c) Indicate the purpose of the message digest or hash function used in digital signatures, and what risks might be associated with Hash Collisions. **(6 marks)**

**A2.**

A university library service wishes to open a new branch library at a location off campus. The new site will connect to the university LAN through a point-to-point wireless solution.

The branch library will offer patrons public WiFi access, as well as a wired network of wired Ethernet connected PCs to support staff and public workstations. All users will need access to the World Wide Web.

The library runs a library management system that must be available to staff and patrons through its web based Online Public Access Catalogue (OPAC), but the server for this will be maintained at the main university campus server room.

The university is short of available IPv4 addresses but must continue to support IPv4. They propose to allocate the private address range 10.1.1.0/24 to the branch library.

Considering the requirements indicated above:

- a) Design a network topology for the library. Draw a diagram of your solution that clearly identifies any network hardware and software components that would be required to implement your solution.
  
- b) Provide suitable IP addresses to each subnet, computer and switching component within your diagram.
  
- c) For **each** hardware and software component required to implement your solution, describe its function and justify why it is required. **(25 marks)**

**Section B**  
**Answer Section B questions in Answer Book B**

**B3.**

- a) Outline the differences between Network Operating Systems and Distributed Operating Systems. **(10 marks)**
  
- b) Explain the two main communication strategies known as packet switching and circuit switching. **(6 marks)**
  
- c) Define the term Distributed Shared Memory (abbreviated as DSM) and give a short description of its four basic implementation algorithms:
  - i) Central Server Algorithm
  - ii) Migration Algorithm
  - iii) Read Replication Algorithm
  - iv) Full Replication Algorithm. **(9 marks)**

**B4.**

- a) Explain what Simple Network Management Protocol (SNMP) is and describe how the five types of messages, GET, GET-NEXT, GET\_RESPONSE, SET and TRAP, are used in the protocol. **(8 marks)**
  - i) Within the network management system domain explain the term 'Baseline network behaviour'. **(5 marks)**
  
  - ii) The text below displays an example of the output of a ping command. Explain what information is observed in the output and its meaning. Your answer must make reference to icmp, icmp\_seq and ttl. **(12 marks)**

```
$ ping 172.217.169.68
PING 172.217.169.68 (172.217.169.68): 56 data bytes
64 bytes from 172.217.169.68: icmp_seq=0 ttl=116
time=17.078 ms
64 bytes from 172.217.169.68: icmp_seq=1 ttl=116
time=16.668 ms
64 bytes from 172.217.169.68: icmp_seq=2 ttl=116
time=16.983 ms
```

[Turn Over]