FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION FOR
RECRUITMENT TO POSTS IN BPS-17 UNDER
THE FEDERAL GOVERNMENT, 2010

COMPUTER SCIENCE

Roll Number

TIME ALLOWED:	**(PART-I) 30 MINUTES**	**MAXIMUM MARKS:20**
	(PART-II) 2 HOURS & 30 MINUTES	**MAXIMUM MARKS:80**

NOTE: (i) **First** attempt **PART-I (MCQ)** on separate **Answer Sheet** which shall be taken back after **30 minutes.**
(ii) Overwriting/cutting of the options/answers will not be given credit.

PART – I (MCQ)
(COMPULSORY)

Q.1. Select the best option/answer and fill in the appropriate box on the Answer Sheet. (20)

(i) Object (also called ____) is a common data type that includes photograph, audio, video, or a document created in other applications.
(a) Number (b) BLOB (c) Integer (d) Binary (e) None of these

(ii) In a database, a(n) ____ is a group of related fields.
(a) Table (b) Key (c) Record (d) Primary Field (e) None of these

(iii) In a database, a(n) ____ field is a field that uniquely identifies each record in a file.
(a) Main (b) Identifying (c) Master (d) Key (e) None of these

(iv) If the lowest annual fee at a discount warehouse is Rs.2025 and the highest is Rs. 5550, a(n) ____ on the Annual Fee field ensures it is a value between Rs. 2025 and Rs. 5550.
(a) Range Check (b) Completeness Check (c) consistency check
(d) alphabetic/numeric check (e) None of these

(v) A DBMS uses the ____ to perform validation checks.
(a) Data Server (b) data mart (c) data warehouse (d) data dictionary
(e) None of these

(vi) _____ is a network technology that defines how messages are routed from one end of a network to the other, ensuring the data arrives correctly by dividing it into packets.
(a) HTML (b) XML (c) HTTP (d) TCP/IP (e) None of these

(vii) When a computer sends data over the Internet, the data is divided into small pieces, or ____.
(a) Bundles (b) Packets (c) Slices (d) Baskets (e) None of these

(viii) The amount of data, instructions, and information that can travel over a communications channel sometimes is called the ____.
(a) Broadband (b) Baseband (c) Latency (d) Bandwidth (e) None of these

(ix) Fiber-optic cables have all of the following advantages over cables that use wire *except* ____.
(a) lower costs and easier installation and modification
(b) faster data transmission and smaller size
(c) less susceptible to noise from other devices
(d) better security for signals during transmission
(e) None of these

(x) A _____ is a network that connects computers and devices in a limited geographical area, such as a home, school computer laboratory, or office building.
(a) local area network (LAN) (b) metropolitan area network (MAN)
(c) wide area network (WAN) (d) variable area network (VAN) (e) None of these

(xi) With ____ memory, the operating system allocates a portion of a storage medium, usually the hard disk, to function as additional RAM.
(a) Virtual (b) Performance (c) Device (d) Managed (e) None of these

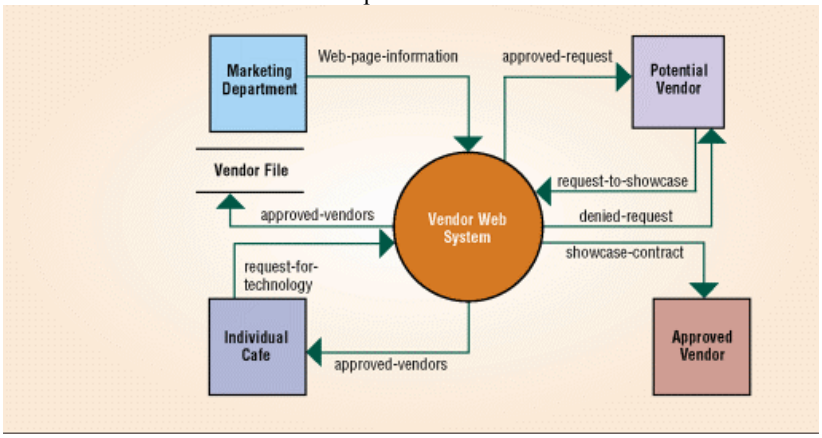
(xii) If a new device, such as a printer or scanner, is attached to a computer, its ____ must be installed before the device can be used.
(a) Driver (b) Platform (c) Manager (d) Kernel (e) None of these

(xiii) A ____ is an icon on the desktop that provides a user with immediate access to a program or file.
(a) Kernel (b) Spooler (c) Buffer (d) Shortcut (e) None of these

(xiv) _____ a disk, or reorganizing it so the files are stored in contiguous sectors, speeds up disk access and thus the performance of the entire computer.
(a) Formatting (b) Defragmenting (c) Spooling (d) Compressing (e) None of these

(xv) The term, computer ____, describes a potentially damaging computer program that affects, or infects, a computer negatively by altering the way the computer works without the user's knowledge or permission.
(a) Hotspot (b) file compression utility (c) virus
(d) file conversion utility (e) None of these

(xvi) In a diagram such as the one pictured in Figure below, a(n) ____ shows the input or output of information into or out from a process.



(a) use case (b) data flow (c) entity relationship
(d) class diagram (e) None of these

(xvii) Although used in all types of business modeling, the ____ has been adopted as a standard notation for object modeling.
(a) UML (b) CASE Tool (c) USE CASE diagram
(d) EMR (e) None of these

(xviii) For each input and output, a systems analyst typically develops a(n) ____, which is a sample of the input or output and contains actual data.
(a) Adaptation (b) Prototype (c) Mockup (d) feasibility scheme (e) None of these

(xix) A(n) ____ is a working model of a proposed system.
(a) adaptation (b) feasibility scheme (c) mockup (d) prototype (e) None of these

(xx) A unit test ____.
(a) verifies that each individual program works by itself ANS A
(b) verifies that all programs in an application work together properly
(c) verifies that an application works with other applications
(d) is performed by end-users and verifies that the new system works with actual data
(e) None of these

PART – II

NOTE:	**(i)** **PART-II** is to be attempted on the separate **Answer Book.** **(ii)** Attempt **ONLY FOUR** questions from **PART-II**, selecting at least **ONE** question from each **SECTION.** All questions carry **EQUAL** marks. **(iii)** Extra attempt of any question or any part of the attempted question will not be considered. **(iv)** Use of **Calculator** is allowed.

SECTION – I

Q.2. (a) List OSI Seven Layers in order and briefly describe functions of each layer **(10+6+4)**
(b) What is difference between IPv4 and IPv6. Why IPv6 was developed when there IPv4 was already available and implemented?
(c) What is difference between physical address, logical address, domain and port number?

Q.3. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds: **(8+4+4+4)**

Process	Burst Time	Priority
*P*1	10	3
*P*2	1	1
*P*3	2	3
*P*4	1	4
*P*5	5	2

The processes are assumed to have arrived in the order *P*1, *P*2, *P*3, *P*4, *P*5, all at time 0.

(a) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, nonpreemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
(b) What is the turnaround time of each process for each of the scheduling algorithms in part a?
(c) What is the waiting time of each process for each of the scheduling algorithms in part a?
(d) Which of the schedules in part a results in the minimal average waiting time (over all processes)?

Q.4. (a) Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames. **(6+10+4)**

(i) How many bits are there in the logical address?
(ii) How many bits are there in the physical address?

(b) Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?
(i) 0,430 (ii) 1,10 (iii) 2,500 (iv) 3,400 (v) 4,112

(c) What are the four necessary conditions for deadlock? Define each condition.

SECTION – II

Q. 5. (a) Define following terms: **(16+4)**

(i) Class (ii) Encapsulation (iii) Abstraction
(iv) Shadowing (v) Inheritance (vi) Polymorphism
(vii) Copy Constructor (viii) Serialization

(b) Write the output of the following program:

```
class Crectangle
{
        private:
              int    width, height;
        public:
              CRectangle (int, int);
              ~CRectangle ();
              int area (void)
             {
                  return (width *height);
             }
};
CRectangle::CRectangle (int a, int b)
{
           width =  a;
           height = b;
}
void main ()
{
            CRectangle recta (3,4), rectb (5,6);
            cout<<"recta area = " << rect.area() << endl;
            cout<<"rectb area = "<< rectb.area()<< endl;
}
```

Q.6. (a) Suppose the following sorted array A of integers: **(6+7+7)**

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
1	2	5	7	9	11	13

If you perform the binary search, for each of the search keys given below, write down the sequence of array values that are compared with the search value during the search.

Searching for 2	Searching for 13	Searching for 8

(b) Trace the execution of SELECTION SORT on the following array by showing the contents of the array after every step.

A[0]	A[1]	A[2]	A[3]
20	18	10	15

(c) If we implement the binary search tree with an array A, what will be the status of the array A after inserting the values {7, 4, 1, 3, 11} to an initially empty tree?

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]	A[7]	A[8]	A[9]	A[10]

SECTION – III

Q.7. (a) Why normalization is used in relational databases? Define second and third normal form with an example. **(10+3+3+4)**

(b) What is difference between primary key and the alternate key? Why primary key is used in each relation?

(c) What is difference between weak entity and strong entity?

(d) Draw an entity relationship diagram between EMPLOYEES, DEPARTMENTS and PROJECTS assuming that each project can be started by only one department and each employee can be employed by only one department at a time. Write down any other assumption if you use it.

Q.8. (a) Given a point P(10, 10). Rotate this point around origin O(0, 0) at an angle of 90 degree anti-clockwise and calculate the resulting point **(8+8+4)**

(b) Write down the conditions for point clipping

(c) What are the major components of a Cathode Ray Tube (CRT). Write down names only

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