POST GRADUATE COMMON ENTRANCE TEST-2018

DATE and TIME	COURSE	SUBJECT
14-07-2018 10.30 a.m. to 12.30 p.m.	Department of Post Graduate Studies and Research in Mathematics and Computer Science, Kuvempu University and Department of Studies in Computer Science, University of Mysore	MATHEMATICS AND COMPUTER SCIENCE

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
100	150 Minutes	120 Minutes

MENTION YOUR PGCET NO.					QUESTION BOOKLET DETAILS	
					VERSION CODE	SERIAL NUMBER
					A	158017

DOs :

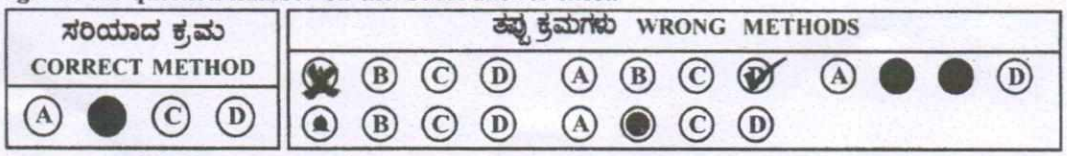
1. Candidate must verify that the PGCET number & Name printed on the OMR Answer Sheet is tallying with the PGCET number and Name printed on the Admission Ticket. Discrepancy if any, report to invigilator.
2. This question booklet is issued to you by the invigilator after the **2nd bell i.e., after 10.25 a.m.**
3. The Version Code of this Question Booklet should be entered on the OMR Answer Sheet and the respective circle should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should be entered on the Nominal Roll without any mistakes.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts :

1. **The timing and marks printed on the OMR answer sheet should not be damaged / mutilated / spoiled.**
2. The **3rd Bell rings at 10.30 a.m., till then;**
   - Do not remove the paper seal / polythene bag present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 75 (items) questions and each question will have one statement and four answers. (Four different options / responses.)
2. After the **3rd Bell is rung at 10.30 a.m.,** remove the paper seal / polythene bag on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 120 minutes:
   - Read each question (item) carefully.
   - Choose one correct answer from out of the four available responses (options / choices) given under each question / item. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **only one response** for each item.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**



4. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
5. After the **last Bell is rung at 12.30 p.m.,** stop marking on the OMR answer sheet and affix your **left hand thumb impression** on the OMR answer sheet as per the instructions.
6. Handover the **OMR ANSWER SHEET** to the room invigilator as it is.
7. After separating the top sheet (KEA copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
8. Preserve the replica of the OMR answer sheet for a minimum period of **ONE year**.
9. Only **Non-programmable** calculators are allowed.

Marks Distribution

PART-1 : 50 QUESTIONS CARRY ONE MARK EACH (1 TO 50)
PART-2 : 25 QUESTIONS CARRY TWO MARKS EACH (51 TO 75)

M/C-A

Mathematics and Computer Science

PART – I

Each question carries ONE mark. **(50 × 1 = 50)**

1. Given y = sin 2x, dy/dx at $x = 3$ is mostly near
   (A) 0.9600
   (B) 0.9945
   (C) 1.920
   (D) 1.989

2. Given $Y = x^3 \ln x$, dy/dx is
   (A) $3x^2 \ln x$
   (B) $3x^2 \ln x + x^2$
   (C) x^2
   (D) $3x$

3. The two types of errors that are related to differentials are
   (A) Human, Absolute
   (B) Absolute, Relative
   (C) Relative, Controllable
   (D) Controllable, Natural

4. The 2nd derivative of a function at point P is 0, and concavity is positive for values to the right of P. What must the concavity be to the left of P for P to be an inflection point ?
   (A) The concavity must also be positive.
   (B) The concavity must be negative.
   (C) The concavity must be neutral (0).
   (D) The concavity must be imaginary.

5. Evaluate the limit :

$$\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}.$$

   (A) –1
   (B) 0
   (C) ½
   (D) The limit does not exist.

6. A partial differential equation requires
   (A) exactly one independent variable
   (B) two or more independent variables
   (C) more than one dependent variable
   (D) equal number of dependent and independent variables

7. The partial differential equation :

$$5\frac{\partial^2 z}{\partial x^2} + 6\frac{\partial^2 z}{\partial y^2} = xy$$

   is classified as
   (A) elliptic
   (B) parabolic
   (C) hyperbolic
   (D) None of the above

Space For Rough Work

8. The following is true for the following partial differential equation used in non-linear mechanics known as the Korteweg-de Vries equation.

$$\frac{\partial w}{\partial t}+\frac{\partial^3 w}{\partial x^3}-6w\frac{\partial w}{\partial x}=0$$

(A) linear; 3rd order
(B) non-linear; 3rd order
(C) linear; 1st order
(D) non-linear; 1st order

9. A Laplace Transform exists when
a. The function is piece-wise continuous.
b. The function is of exponential order.
c. The function is piecewise discrete.
d. The function is of differential order.
(A) a & b
(B) c & d
(C) a & d
(D) b & c

10. According to the time-shifting property of Laplace Transform, shifting the signal in time domain corresponds to the
(A) Multiplication by e^{-st_o} in the time domain
(B) Multiplication by e^{-st_o} in the frequency domain
(C) Multiplication by e^{st_o} in the time domain
(D) Multiplication by e^{st_o} in the frequency domain

11. Unilateral Laplace Transform is applicable for the determination of linear constant coefficient differential equations with
(A) Zero initial condition
(B) Non-zero initial condition
(C) Zero final condition
(D) Non-zero final condition

12. Laplace transform of cosωt is ss2 + ω2. The Laplace transform of e – 2tcos4t is
(A) s – 2s – 22 + 16
(B) s + 2s – 22 + 16
(C) s – 2s + 22 + 16
(D) s + 2s + 22 + 16

13. The inverse Laplace transform of $1/(s^2+s)$ is
(A) $1 + e^t$
(B) $1 - e^t$
(C) $1 - e^{-t}$
(D) $1 + e^{-t}$

14. There are two containers, with one containing 4 Red and 3 Green balls and the other containing 3 Blue and 4 Green balls. One ball is drawn at random from each container. The probability that one of the balls is Red and the other is Blue will be
(A) 1/7
(B) 9/49
(C) 12/49
(D) 3/7

Space For Rough Work

15. A person on a trip has a choice between private car and public transport. The probability of using a private car is 0.45. While using the public transport, further choices available are bus and metro, out of which the probability of commuting by a bus is 0.55. In such a situation, the probability (rounded up to two decimals) of using a car, bus and metro, respectively would be

(A) 0.45, 0.30 and 0.25

(B) 0.45, 0.25 and 0.30

(C) 0.45, 0.55 and 0.00

(D) 0.45, 0.35 and 0.20

16. A two-faced fair coin has its faced designated as head(H) and tail(T). This coin is tossed three times in succession to record the following outcomes. H, H, H. If the coin is tossed one more time, the probability (up to one decimal place) of obtaining H again, given the previous realizations of H, H and H would be

(A) 0.5 to 0.5

(B) 0.5 to 1

(C) 0.5 to 1.5

(D) 1.5 to 0.5

17. Type II error in hypothesis testing is

(A) acceptance of the null hypothesis when it is false and should be rejected.

(B) rejection of the null hypothesis when it is true and should be accepted.

(C) rejection of the null hypothesis when it is false and should be rejected.

(D) acceptance of the null hypothesis when it is true and should be accepted.

18. Probability density function of a random variable X is given below

$F(x) = \{ 0.25$ if $1 <= x <= 5$

0 otherwise

$P(X <= 4)$ is

(A) 3/4

(B) 1/2

(C) 1/4

(D) 1/8

19. The spot speeds (expressed in km/hr) observed at a road section are 66, 62, 45, 79, 32, 51, 56, 60, 53 and 49. The median speed (expressed in km/hr) is

(Note : answer with one decimal accuracy)

(A) 54.49:54.51

(B) 54.52:54.52

(C) 53.52:54.50

(D) 53.62:54.58

Space For Rough Work

20. Consider the following probability mass function (p.m.f.) of a random variable X.

$$p(x,q)=\begin{cases} q & \text{if } x=0 \\ 1-q & \text{if } x=1 \\ 0 & \text{otherwise} \end{cases}$$

If $q = 0.4$, the variance of X is

(A) 0.28 to 0.25

(B) 0.23 to 0.25

(C) 0.23 to 0.29

(D) 0.24 to 0.30

21. The probability density function of a random variable, x is

$$f(x)=\frac{x}{4}(4-x^2) \text{ for } 0\le x\le 2$$

$$= 0 \text{ otherwise}$$

The mean, μ_x of the random variable is

(A) 1.06 to 1.07

(B) 0.23 to 0.25

(C) 1.06 to 1.08

(D) 2.06 to 1.07

22. A fair (unbiase) coin was tossed four times in succession and resulted in the following outcomes : (i) Head, (ii) Head, (iii) Head, (iv) Head. The probability of obtaining a 'Tail' when the coin is tossed again is

(A) 0

(B) 1/2

(C) 4/5

(D) 1/5

23. The annual precipitation data of a city is normally distributed with mean and standard deviation as 1000 mm and 200 mm, respectively. The probability that the annual precipitation will be more than 1200 mm is

(A) <50%

(B) 50%

(C) 75%

(D) 100%

24. In an experiment, positive and negative values are equally likely to occur. The probability of obtaining at most one negative value in five trials is

(A) 1/32

(B) 2/32

(C) 3/32

(D) 6/32

25. A person on a trip has a choice between private car and public transport. The probability of using a private car is 0.45. While using the public transport, further choices available are bus and metro, out of which the probability of commuting by a bus is 0.55. In such a situation, the probability (rounded up to two decimals) of using a car, bus and metro, respectively would be

(A) 0.45, 0.30 and 0.25

(B) 0.45, 0.35 and 0.25

(C) 0.40, 0.30 and 0.25

(D) 0.45, 0.36 and 0.24

Space For Rough Work

26. In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together ?

(A) 360

(B) 480

(C) 720

(D) 5040

27. How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated ?

(A) 159

(B) 194

(C) 205

(D) 209

28. Which of the following is true about Huffman Coding ?

(A) Huffman coding may become lossy in some cases.

(B) Huffman Codes may not be optimal lossless codes in some cases.

(C) In Huffman coding, no code is prefix of any other code.

(D) All of the above

29. A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency :

Character	Frequency
a	5
b	9
c	12
d	13
e	16
f	45

(Note that each character in input message takes 1 byte.)

If the compression technique used is Huffman Coding, how many bits will be saved in the message ?

(A) 224

(B) 800

(C) 576

(D) 324

30. A binary operation $\oplus$ on a set of integers is defined as $x \oplus y = x^2 + y^2$. Which one of the following statements is TRUE about $\oplus$?

(A) Commutative but not associative.

(B) Both commutative and associative.

(C) Associative but not commutative.

(D) Neither commutative nor associative.

Space For Rough Work

31. Consider the set $S = \{1, \omega, \omega^2\}$, where ω and ω^2 are cube roots of unity. If * denotes the multiplication operation, the structure (S, *) forms

(A) A group
(B) A ring
(C) An integral domain
(D) A field

32. Which one of the following in NOT necessarily a property of a Group ?

(A) Commutativity
(B) Associativity
(C) Existence of inverse for every element
(D) Existence of identity

33. Consider the binary relation $R = \{(x, y), (x, z), (z, x), (z, y)\}$ on the set $\{x, y, z\}$. Which one of the following is TRUE ?

(A) R is symmetric but NOT antisymmetric.
(B) R is NOT symmetric but antisymmetric.
(C) R is both symmetric and antisymmetric.
(D) R is neither symmetric nor antisymmetric.

34. If P, Q, R are subsets of the universal set U, then $(P \cap Q \cap R) \cup (P^C \cap Q \cap R) \cup Q^C \cup R^C$ is

(A) $Q^C \cup R^C$
(B) $P \cup Q^C \cup R^C$
(C) $P^C \cup Q^C \cup R^C$
(D) $\cup$

35. Let S be a set of n elements. The number of ordered pairs in the largest and the smallest equivalence relations on S are :

(A) n and n
(B) n^2 and n
(C) n^2 and 0
(D) n and 1

36. How many different non-isomorphic Abelian groups of order 4 are there ?

(A) 2
(B) 3
(C) 4
(D) 5

37. A relation R is defined on ordered pairs of integers as follows : (x,y) R(u,v) if $x < u$ and $y > v$, then R is

(A) Neither a Partial Order nor an Equivalence Relation
(B) A Partial Order but not a Total Order
(C) A Total Order
(D) An Equivalence Relation

38. Let S denote the set of all functions $f : \{0,1\}^4 \rightarrow \{0,1\}$. Denote by N the number of functions from S to the set $\{0,1\}$. The value of Log_2Log_2N is

(A) 12
(B) 13
(C) 14
(D) 16

Space For Rough Work

39. Consider the following relation on subsets of the set S of integers between 1 and 2014. For two distinct subsets U and V of S we say U < V if the minimum element in the symmetric difference of the two sets is in U. Consider the following two statements :

S1 : There is a subset of S that is larger than every other subset.

S2 : There is a subset of S that is smaller than every other subset.

Which one of the following is CORRECT

(A) Both S1 and S2 are true.

(B) S1 is true and S2 is false.

(C) S2 is true and S1 is false.

(D) Neither S1 nor S2 is true.

40. Let X and Y be finite sets and f: X -> Y be a function. Which one of the following statements isTrue ?

(a) For any subsets A and B of X, $|f(A \cup B)| = |f(A)| + |f(B)|$

(b) For any subsets A and B of X, $f(A \cap B) = f(A) \cap f(B)$

(c) For any subsets A and B of X, $|f(A \cap B)| = \min \{|f(A)|, |f(B)|\}$

(d) For any subsets S and T of Y, $f^{-1}(S \cap T) = f^{-1}(S) \cap f^{-1}(T)$

(A) a

(B) b

(C) c

(D) d

41. Let G be a group with 15 elements. Let L be a subgroup of G. It is known that L != G and that the size of L is at least 4. The size of L is

(A) 3

(B) 5

(C) 7

(D) 9

42. Let $\sum$ = (a, b, c, d, e) be an alphabet. We define an encoding scheme as :

g(a) = 3, g(b) = 5, g(c) = 7, g(d) = 9, g(e) = 11. Which of the following numbers is the encoding h of a non-empty sequence of strings ?

Let P_i denote the i-th prime number ($P_1 = 2$).

For a non-empty string $s = a_1 \ldots a_n$, where each $a_i \in \sum$, define

$f(s) = \Pi^n{}_{i=1} P_i^{g(a_i)}$

For a non-empty sequence $< s_j, \ldots, s_n >$ of strings from $\sum^+$,

define $h(\langle S_i \ldots S_n \rangle) = \Pi^n{}_{i=1} P_i^{f(si)}$

(A) $2^7\,3^7\,5^7$

(B) $2^8\,3^8\,5^8$

(C) $2^9\,3^9\,5^9$

(D) $2^{10}\,5^{10}\,7^1$

43. The binary relation S = ϕ (empty set) on set A = {1, 2, 3} is :

(A) Neither reflexive nor symmetric

(B) Symmetric and reflexive

(C) Transitive and reflexive

(D) Transitive and symmetric

Space For Rough Work

44. Consider the following statements :

S1 : There exists infinite sets A, B, C such that $A \cap (B \cup C)$ is finite.

S2 : There exists two irrational numbers x and y such that $(x + y)$ is rational.

Which of the following is true about S1 and S2 ?

(A) Only S1 is correct.

(B) Only S2 is correct.

(C) Both S1 and S2 are correct.

(D) None of S1 and S2 is correct.

45. Which one of the following well formed formulae is a tautology ?

(a) $\forall x \exists y R(x, y) \leftrightarrow \exists y \forall x R(x, y)$

(b) $(\forall x [\exists y R(x, y) \rightarrow S(x, y)]) \rightarrow \forall x \exists y S(x, y)$

(c) $[\forall x \exists y (P(x, y) \rightarrow R(x, y)] \leftrightarrow [\forall x \exists y (\neg P(x, y) \vee R(x, y)]$

(d) $\forall x \forall y P(x, y) \rightarrow \forall x \forall y P(y, x)$

(A) a

(B) b

(C) c

(D) d

46. Which among the below stated Boolean expressions do not obey De-Morgan's theorem ?

(A) $X + Y = X \cdot Y$

(B) $X \cdot Y = X + Y$

(C) $X \cdot Y = X + Y$

(D) None of the above

47. Sum of products can be done using

(A) Demorgan's theorem

(B) Algebraic theorem

(C) Demorgan's postulate

(D) Algebraic postulate

48.

p	q	$p \neq q$
0	0	0
0	1	1
1	0	1
1	1	0

The binary operator $\neq$ is defined by the following truth table. Which one of the following is true about the binary operator $\neq$?

(A) Both commutative and associative

(B) Commutative but not associative

(C) Not commutative but associative

(D) Neither commutative nor associative

49. The cardinality of the power set of $\{0, 1, 2 \ldots, 10\}$ is

(A) 1024

(B) 1023

(C) 2048

(D) 2043

50. Let X and Y denote the sets containing 2 and 20 distinct objects respectively and F denote the set of all possible functions defined from X and Y. Let f be randomly chosen from F. The probability of f being one-to-one is

(A) 0.95

(B) 0.80

(C) 0.75

(D) 0.70

Space For Rough Work

PART – II

Each question carries two marks. **(25 × 2 = 50)**

51. Ctrl, Shift and Alt are called _____ keys.

(A) modifier

(B) function

(C) alphanumeric

(D) adjustment

52. Computer Monitor is also known as :

(A) DVUB.

(B) UVD

(C) VDUD

(D) CCTV

53. Microsoft Office is an example of a

(A) Closed source software

(B) Open source software

(C) Horizontal market software

(D) Vertical market software

54. _____ transforms one interface into another interface.

(A) Program

(B) Software

(C) Data

(D) None of the above

55. Which of the memories below is often used in a typical computer operation ?

(A) RAM

(B) ROM

(C) FDD

(D) HDD

56.
```
#include<stdio.h>
int main()
{
int n;
for(n = 7; n!=0; n--)
printf("n = %d", n--);
getchar();
return 0;
}
```

The output of the program is

(A) 7

(B) 8

(C) 0

(D) Infinite Loop

Space For Rough Work

57. #include <stdio.h>

```
int main()
{
inti ;
i = 1, 2, 3;
printf("i = %d\n", i);
getchar();
return 0;
}
```

(A) 1

(B) 2

(C) 3

(D) Infinite Loop

58. #include "stdio.h"

```
int main()
{
    char a[] = { 'A', 'B', 'C', 'D' };
    char* ppp = &a[0];
    *ppp++; // Line 1
printf("%c %c ", *++ppp, --*ppp); // Line 2
}
```

(A) C B

(B) B A

(C) B C

(D) C A

59. What will be the output of following program ?

```
#include <stdio.h>
intmain()
{
intnum = 10;
printf("num = %d addresss of num = %u", num, &num);
num++;
printf("\n num = %d addresss of num = %u", num, &num);
return 0;
}
```

(A) Compilation error

(B) num = 10 address of num = 2293436
num = 11 address of num = 2293438

(C) num = 10 address of num = 2293436
num = 11 address of num = 2293440

(D) num = 10 address of num = 2293436
num = 11 address of num = 2293436

60. If a variable is a pointer to a structure, then which of the following operator is used to access data members of the structure through the pointer variable ?

(A) .

(B) &

(C) *

(D) ->

Space For Rough Work

61. What will happen if in a C program you assign a value to an array element whose subscript exceeds the size of array ?

(A) The element will be set to 0.

(B) The compiler would report an error.

(C) The program may crash if some important data gets overwritten.

(D) The array size would appropriately grow.

62. What does the following declaration mean ?

int (*ptr)[10];

(A) ptr is array of pointers to 10 integers.

(B) ptr is a pointer to an array of 10 integers.

(C) ptr is an array of 10 integers.

(D) ptr is an pointer to array.

63. In C, if you pass an array as an argument to a function, what actually gets passed ?

(A) Value of elements in array

(B) First element of the array

(C) Base address of the array

(D) Address of the last element of array

64. For a binary search algorithm to work, it is necessary that the array (list) must be

(A) sorted

(B) unsorted

(C) in a heap

(D) popped out of stack

65. Apriory algorithm analysis does not include

(A) Time Complexity

(B) Space Complexity

(C) Program Complexity

(D) None of the above

66. If queue is implemented using arrays, what would be the worst run time complexity of queue and dequeue operations ?

(A) O(n), O(n)

(B) O(n), O(1)

(C) O(1), O(n)

(D) O(1), O(1)

Space For Rough Work

67. Entries in a stack are "ordered". What is the meaning of this statement ?

(A) A collection of stacks is sortable.

(B) Stack entries may be compared with the '<' operation.

(C) The entries are stored in a linked list.

(D) There is a Sequential entry that is one by one.

68. What is the output of this C code ?

```
#include <stdio.h>
intmain()
{
inti = 3;
int l = i / -2;
int k = i % -2;
printf("%d %d\n", l, k);
return 0;
}
```

(A) Compile time error

(B) -1 1

(C) 1 -1

(D) Implementation defined

69. The output of the code below is (when 1 is entered)

```
#include <stdio.h>
void main()
{
double ch;
printf("enter a value btw 1 to 2:");
scanf("%lf", &ch);
switch (ch)
{
case 1:
printf("1");
break;
case 2:
printf("2");
break;
} }
```

(A) Compile time error

(B) 1

(C) 2

(D) Varies

70. Which of the following is not a valid declaration in C ?

1. short int *x*;
2. signed short *x*;
3. short x;
4. unsigned short x;

(A) 3 and 4

(B) 2

(C) 1

(D) All are valid.

Space For Rough Work

71. Suppose n and p are unsigned int variables in a C program. We wish to set p to nC3. If n is large, which of the following statements is most likely to set p correctly ?

(A) p = n * (n-1) * (n-2) / 6;

(B) p = n * (n-1) / 2 * (n-2) / 3;

(C) p = n * (n-1) / 3 * (n-2) / 2;

(D) p = n * (n-1) * (n-2) / 6.0;

72. "typedef" in C basically works as an alias. Which of the following is correct for "typedef" ?

(A) typedef can be used to alias compound data types such as struct and union.

(B) typedef can be used to alias both compound data types and pointer to these compound types.

(C) typedef can be used to alias a function pointer.

(D) All of the above

73. In which header file is the NULL macro defined ?

(A) stdio.h

(B) stddef.h

(C) stdio.h and stddef.h

(D) math.h

74. Which of the following is not a storage class specifier in C ?

(A) auto

(B) register

(C) volatile

(D) extern

75. Which bitwise operator is suitable for turning on a particular bit in a number ?

(A) && operator

(B) & operator

(C) || operator

(D) | operator

Space For Rough Work

Space For Rough Work