PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MCA DEGREE EXAMINATION DECEMBER 2018
(First Semester)

Branch – **COMPUTER APPLICATIONS**

MATHEMATICAL STRUCTURES

Time: Three Hours   Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks   (10 x 1 = 10)

1 Indicate $\rceil(p \wedge q)$ is equivalent to _____.
   (i)   q   (ii) p
   (iii) $\rceil p \vee q$ (iv) $(\rceil p \vee \rceil q)$

2 The truth table of a _____ will contain only T entries in the last column
   (i)   tautology   (ii) contradiction
   (iii) connectives   (iv) contingency

3 The number of relations defined on a finite set with n elements is _____.
   (i)   2n   (ii) n^2
   (iii) 2^n (iv) 2^{n-1}

4 If $f : A \rightarrow B$ is such that $f(x) = x - 1$ and $g : B \rightarrow C$ is such that $g(y) = y^2$, then fog (2) = _____.
   (i)   3   (ii) 1
   (iii) 2   (iv) 0

5 Bolzano's method is also called as _____ method.
   (i)   false position   (ii) regula falsi
   (iii) bisection   (iv) iteration

6 The rate convergency in Gauss – Seidel method is roughly ____ times than that of Gauss – Jacobi method.
   (i)   four   (ii) three
   (iii) one time   (iv) two

7 A game is said to be strictly determiable if _____.
   (i) $\underline{v} = v = \bar{v}$ (ii) $\underline{v} \leq v \leq \bar{v}$
   (iii) $\underline{v} = 0 = \bar{v}$ (iv) $\underline{v} \geq v \geq \bar{v}$

8 The value of the game

             Player A

   Player B $\begin{bmatrix} 2 & 4 \\ 10 & 7 \end{bmatrix}$ is _____.

   (i)   2   (ii) 4   (iii) 10   (iv) 7

9 The critical path in a network is _____.
   (i)   longest time path   (ii) shortest time path
   (iii) mean time path   (iv) dummy path

10 In PERT, the value of σ^2 is _____.
   (i) $\left(\dfrac{t_p - t_0}{}\right)^2$ (ii) $\left(\dfrac{t_p - t_m}{}\right)^2$

SECTION - B (25 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks   (5 x 5 = 25)

11 a Show that $(p \wedge q) \wedge \sim ((p \vee q)$ is a fallacy nor contradiction.

OR

b Explain the validity of the argument $\begin{array}{l} p \Rightarrow q \\ q \Rightarrow p \\ \hline \therefore p \vee q \end{array}$.

12 a Show that the relation $\subseteq$ (subset) defined on a power set P(A) of the set A is a partial order relation.

OR

b Show that the function f defined by $f : R \to R$ such that $f(x) = -\sin x$, for all x in R, is neither one-one nor onto, where R is the set of all real numbers.

13 a Solve the real root of the equation $x^3 - 3x - 5 = 0$, correct to three decimal places by Regula – Falsi method.

OR

b Solve the following system of equations by Gauss – elimination method :
$2x + 3y - z = 5$; $4x + 4y - 3z = 3$; $2x - 3y + 2z = 2$

14 a Solve the game whose payoff matrix is given by :

$$\begin{array}{c} \text{Player B} \\ \begin{array}{cc} & \begin{array}{ccc} B_1 & B_2 & B_3 \end{array} \\ \text{Player A} \begin{array}{c} A_1 \\ A_2 \\ A_3 \end{array} & \begin{bmatrix} 15 & 2 & 3 \\ 6 & 5 & 7 \\ -7 & 4 & 0 \end{bmatrix} \end{array} \end{array}$$

OR

b Solve the following game and find the value of the game

$$\begin{array}{c} \text{Player B} \\ \text{Player A} \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix} \end{array}$$

15 a Explain a network and state the rules for constructing the network.

OR

b Organize the arrow network diagram comprising activities A,B,…and L such that the following relationship are satisfied:
(i) A,B and C, the first activities of the project, can start simultaneously;
(ii) A and B proceed D;
(iii) B proceeds E,F and H;
(iv) F and G proceed G;
(v) E and H proceed I and J;
(vi) C,D,F and J proceed K;
(vii) K proceeds L;
(viii) I, G and L are the terminal activities of the project.

SECTION -C (40 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks   (5 x 8 = 40)

17 a If R is a relation on a set A, then prove that
   (i) when R is reflexive, R^{-1} is also reflexive;
   (ii) R is symmetric if and only if $R=R^{-1}$
   (iii) R is anti-symmetric if and only if $R \cap R^{-1} I_A$.

OR

b If $f: A \to B$ and $g: B \to C$ are invertible functions, then prove that

   $gof: A \to C$ is also invertible and $(gof)^{-1} = f^{-1} og^{-1}$.

18 a Find the positive root of the equation x-cosx=0 by direction method.

OR

b Solve the following equations by Gauss-Seidal method, correct to 3 decimal

   places.

   x+y+54z=110; 27x+6y-z=85; 6x+15y+2z=72.

19 a Solve the following game and find the value of the game
       Player B

   Player A $\begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$

OR

b Solve the game graphically:

       Player B

   Player A $\begin{bmatrix} 1 & 3 & -3 & 7 \\ 2 & 5 & 4 & -6 \end{bmatrix}$

20 a A project consists of a series of tasks labeled A,B,...H,I with the following
   [W<X,Y means X and Y cannot stat until W is completed; X,Y<W means W
   cannot start until both X and Y are completed etc.] With this notoation,
   construct the net work diagram having the following constraints: A<D,E;
   B,D<F; C<G; B,G<H; F,G<I.
   Find also the minimum time of completion of the project, when the time (in
   days) of completion of each tasks is as follows:

Task:	A	B	C	D	E	F	G	H	I
Time:	23	8	20	16	24	18	19	4	10

OR

b A project schedule has the following characteristics:

Activity	1-2	2-3	2-4	3-5	4-5	4-6	5-7	6-7	7-8	7-9	8-10	9-10
Most likely Time	2	2	3	4	3	5	5	7	4	6	2	5
Optimistic Time	1	1	1	3	2	3	4	6	2	4	1	3
Pessimistic Time	3	3	5	5	4	7	6	8	6	8	3	7

Invent the critical path and the probability of completing the project in 30
days.

Z-Z-Z   END