

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BVoc DEGREE EXAMINATION MAY 2024
(Fourth Semester)

Branch – NETWORKING & MOBILE APPLICATION

MATHEMATICAL STRUCTURES

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(5 x 1 = 5)

- 1 If A is the matrix of order 3 x 8 and B is the matrix of order 8 x 6, then the order of A x B is
 - (i) 3 x 6
 - (ii) 6 x 3
 - (iii) 3 x 8
 - (iv) 6 x 8
- 2 The operator Δ is called
 - (i) linear operator
 - (ii) linear and difference operator
 - (iii) difference operator
 - (iv) none of these
- 3 Simpson's 3/8 th rule is applicable only when n is
 - (i) multiple of 4
 - (ii) multiple of 6
 - (iii) multiple of 3
 - (iv) multiple of 8
- 4 An activity is critical if its total float is
 - (i) 1
 - (ii) 0
 - (iii) 2
 - (iv) 4
- 5 The expression for Traffic intensity is
 - (i) λ / μ
 - (ii) μ / λ
 - (iii) λ
 - (iv) μ

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks

(5 x 3 = 15)

- 6 a If $A = \begin{bmatrix} 3 & -2 & 0 \\ 1 & 0 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 & 1 \\ -1 & 2 & 3 \\ 4 & 1 & -1 \end{bmatrix}$, find AB and does BA exists?
OR
b Show that the equations $x+2y=3$; $y-z=2$; $x+y+z=1$ are consistent.
- 7 a Find the n^{th} difference of e^x .
OR
b Find a polynomial of degree 2 which takes the values

x	0	1	2	3	4	5	6	7
y	1	2	4	7	11	16	22	29
- 8 a Express the Newton's backward difference formula to compute the first three derivative at any x.
OR
b From the following table, find the value of x for which y is minimum and find this value of y.

x :	.60	.65	.70	.75
y :	.6221	.6155	.6138	.6170
- 9 a State the rules for network construction.
OR
b A project consists of a series of tasks labeled A, B, ..., H, I with the following relationships. Construct the network diagram having the following constraints:
 $A < D$; $E; B, D < F$; $C < G$; $B, G < H$; $F, G < I$
- 10 a Explain about different types of queueing models.
OR
b Assume that the goods trains are coming in a yard at a rate of 30 trains per day. Suppose that the inter arrival times follow an exponential distribution. The service time for each one is assumed to be exponential with an average of 36 minutes. If yard can admit 9 trains at a time, calculate the probability that the yard is empty and find the average queue length.

Cont...

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 x 6 = 30)

11 a Find the inverse of the matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.

OR

b Find the rank of $\begin{bmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{bmatrix}$

12 a Given the following data, find the value of θ at $x=43$ and $x=84$.

x	40	50	60	70	80	90
θ	184	204	226	250	276	304

OR

b Apply Gauss forward formula to find the value of $f(x)$ at $x = 3.75$ from the table.

x :	2.5	3.0	3.5	4.0	4.5	5.0
$f(x)$:	24.145	22.043	20.225	18.644	17.262	16.047

13 a Dividing the range into 10 equal parts, calculate the approximate value of $\int_0^\pi \sin x \, dx$ using Simpson's rule.

OR

b Using the trapezoidal rule evaluate $\int_{0.6}^2 y \, dx$ from the following table:

x :	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
y :	1.23	1.58	2.03	4.32	6.25	8.36	10.23	12.45

14 a Construct the network and calculate the critical path, project duration and hence compute total float, free float and independent float.

Activity	1-2	1-3	2-4	3-4	2-5	4-5	3-6	4-6	4-7	5-7	6-7
Duration(days)	15	20	10	15	25	20	20	15	30	10	20

OR

b Find the expected project duration, expected variance of the duration and standard deviation of the completion time.

Activity	1-2	1-3	1-4	2-4	2-5	3-5	4-5
f_0	2	3	4	8	6	2	2
f_m	4	4	5	9	8	3	5
f_p	5	6	6	11	12	4	7

15 a In a railway marshalling yard, good trains arrive at a rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and service time distribution is also exponential with an average 36 minutes. Calculate the following.

(i) the mean queue size

(ii) the probability that the queue size exceeds 10.

If the input of trains increases to an average 33 per day, what will be the change in (i) and (ii)?

OR

b A supermarket has a single cashier. During the peak hours, customers arrive at a rate of 20 customers per hour. The average number of customers that can be processed by the cashier is 24 per hour. Calculate

(i) Probability that a cashier is idle.

(ii) Average number of customers in the queuing system.

(iii) Queue size

(iv) Average time a customer spends in the system.

(v) Average time a customer spends in the queue waiting for service.