"Education for Knowledge, Science, and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur

(Empowered Autonomous)

KOLHAPUR

DEPARTMENT OF MATHEMATICS

Date: 20/01/2025

Notice
B.Sc. II (Sem IV)
Unit Test: 2024-25

All the students of B.Sc. II Sem IV (Major Mathematics) are hereby informed that their unit test will be conducted on **Monday, 27/01/2025.** Syllabus and timetable for the unit test will be mentioned in following table. All students are directed to present for unit test on time.

Syllabus for Unit test B.Sc. II Sem IV:

Sr. No.	Name of the paper	Units	Time
1	Discrete Mathematics	i)Recurrence relations ii) Basics of graph theory	12:30 PM to 01:30PM

Nature of Question Paper

Time :- 1 Hour **Total Marks: 20**

Q.1) Choose the correct alternative for each of the following. **[04]**

Four questions

Q.2) Attempt any one **[08]**

Two questions

Q.3) Attempt any two **[08]**

Three questions

VIVEKANAND COLLEGE KOLHAPUR (Empowered Autonomous) ESTD JUNE 1964

S Thorat

(Prof. S. P. Thorat)
HEAD
DEPARTMENT OF MATHEMATICS
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)

Vivekanand College Kolhapur (An Empowered Autonomous Institute)
Department of Mathematics
B.Sc. II (Sem IV)
Discrete Mathematics
Unit Test 2024-25

Time & date: 27/01/2025 **Total Marks: 20**

Sr. No.	Roll No.	Name of student	Sign.	Marks
1	7744	CHOUGALE ARPITA BALAVANT	Chougale	15
2	7745	HARGE SANCHIT GURUPRASAD	AB	0
3	7746	KHADE RIYA BALKRISHNA	R.B.Khade	13
4	7747	MAYEKAR PRACHI PUNDLIK	Pmahdm	16
5	7748	PATIL ARIHANT KIRAN	A.K.Patil	19
6	7749	PATIL RAJNANDINI KUNDALIK	Patil R K	17
7	7750	TONAPE SAHIL SHIVAJI	Sahiltonape	16
8	7751	KAMBLE SAMRAT SURESH	kambless	14
9	7960	BANDUKE SIDDHANT SACHIN	AB	0
10	7972	LAD ALOK BAJARANG	AB	0

VIVEKANAND COLLEGE KOLHAPUR (Empowered Autonomous) ESTD JUNE 1964

HEAD
DEPARTMENT OF MATHEMATICS
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)

Vivekanand College, Kolhapur (An Empowered Autonomous Institute)
B.Sc. II (Semester-IV)
Unit test: January 2025

Course Name: Discrete Mathematics | Course Code: DSC03MAT41
Day & Date: Monday, 27/01/2025 | Time: 11.30 am to 12.30 pm
Total Marks: 20
Instructions:
1. All questions are compulsory
2. Figures in right side indicates full marks.

Q.1. Select the correct alternative for each of the following. [04]

i) The number of edges in a complete-bipartite graph $K_{m,n}$ is .....

A) $m+n$ B) $m-n$ C) mn D) m^2+n^2

ii) The vertex of degree ..... is called pendant vertex.

A) 1 B) 2 C) 3 D) 0

iii) Order of recurrence of relation $a_{n+2} - 5a_{n-3} + a_{n-4} = n2^n$ is.....

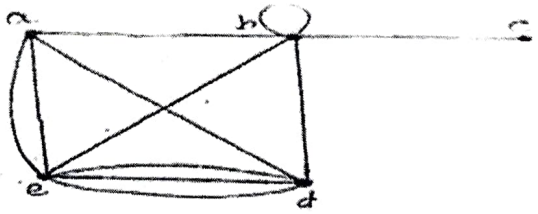
A) 3 B)2 C) 4 D) 6

iv) Particular solution of $a_n = 7a_{n-1}+8$ is.....

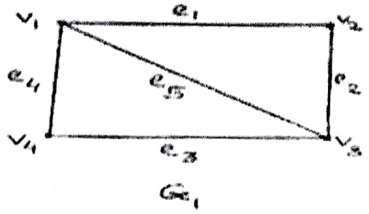
A) $a_n = A_1(-1)^n$ B)$\frac{-4}{3}$ C) $a_n = A_1(-1)^n \frac{-4}{3}$ D) None of these

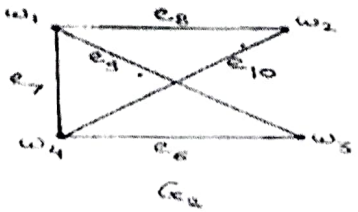
Q.2 Attempt any One of the following. [08]

i) a) Verify Hand Shaking Lemma of the following graphs.



b) Determine whether the following graphs are isomorphic or not.





ii) Find the total solution of the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 7^n$.

Q.3 Attempt any Two of the following. [08]

Q.3 Attempt any Two of the following. **[08]**

i) If G be a graph with n-vertices out of which 't' number of vertices have degree k and others have degree $k+1$ then, prove that $t = (k+1)n - 2e$.

Where, e is the number of edges in G.

ii) Draw the graph with the following incidency matrix

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

iii) Solve the homogeneous solution of the recurrence relation $a_n + 5a_{n-1} + 6a_{n-2} = 0$.

Name - Arihant Kiran Patil

Roll No: 9748

Date : 24-02-25

(अधिकारप्रदत्त स्वायत्त)
कोल्हापूर

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर. (अधिकरप्रदत्त स्वायत्त)

परीक्षेच्या ——— या विषयाच्या प्रयोग परीक्षा

Practical Examination in, ———

at the ——— Examination

उमेदवाराचा आसन क्रमांक ——— विभाग ———
(Candidate's Seat No.) (Section)

उमेदवारांना सूचना

१. प्रश्न काळजीपूर्वक वाचा आणि त्याप्रमाणे विचारलेला प्रयोग करा.
२. उपकरणांच्या वापराबाबत तुम्हांला काही माहीत नसेल तर परीक्षक किंवा प्रयोगशाळा सहाय्यक यांना तुम्हाला मदत करण्याविषयी विनंती करा.
३. कोणताही विद्युतप्रयोग करण्यापूर्वी, प्रत्यक्ष पुरविलेली सर्व उपकरणे आणि सर्व 'कनेक्शन' नीट पाहून घेऊन संबंधित कामाची नीटनेटकी कार्ययोजना करण्याची नितांत आवश्यकता आहे आणि ह्यानंतर पुढे काम चालू करण्याविषयी परीक्षकांची परवानगी मिळविणे आवश्यक आहे.
४. सर्व निरीक्षणे कोटकवजा तक्त्यात भरावी. मधल्या सर्व गणना आणि निर्णय हे क्य तितक्या सुवाच्चपणे आणि स्पष्टपणे नोंदविलेले असणे हे हितावह आहे.
५. प्रारंभिक किंवा अंतिम निरीक्षणात संख्यावाचक आकडे एकावर एक लिहू नयेत. जर लिहिलेला कोणताही आकडा नको असेल तर त्यावर एक रेघ ओढून पाहिजे असलेला आकडा त्याच्याजवळ लिहा. प्रयोगशाळेतून बाहेर पडण्यापूर्वी आपले टेबल चांगल्या स्थितीत आहे याची खात्री करा.

INSTRUCTIONS TO CANDIDATES

1. Read the question carefully and perform the experiment as required.
2. If there by anything the apparatus that you do not know, ask the examiner or the laboratory assistant to help you.
3. Before doing any electrical experiment, it is absolutely essential that you make a neat working sketch of all apparatus actually provided and of the necessary connection and obtain the examiner's permission to proceed.
4. Express all observations in a tabular form. It is also desirable that all intermediate calculations and results should be entered as neatly and clearly as possible.
5. No numerical figures should be written over either in the preliminary or final observations. If any figure is shought to be discarded it should be run through and the desired figure written near to it.
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(येथून लेखनास सुरवात करा.) (Begin writing here.)

प्र. क्र. Q. No.	
	3f 8+8 = (19/20)
Q.1. 1.	C] mn
2.	A] 1
03 3.	D] 6
4.	C] $a_n = A_1(-1)^n - \frac{4}{3}$

02	Section	Q. No.												
		Marks												

प्र. क्र.
Q. No.

Q. 2.

a] To verify the Handshaking lemma.

$$\sum_{i=1}^{n} d(v) = 2e.$$

Now, $d(a) = 4$
$d(b) = 6$
$d(c) = 1$
$d(d) = 5$
$d(e) = 6$

$\therefore \sum d(v) = 22$

Then,

$\sum e = 11$

$\therefore \sum d(v) = 2e$

$= 2 \times 11$

$= 22$

$\therefore$ Handshaking lemma is verify.

b] Isomorphic or not

In this two graph G_1 & G_2 the vertices and edges are equal

$d(v_1) = 3$ $d(v_2) = 2$ $d(v_3) = 3$ $d(v_4) =$

$d(w_1) = 3$ $d(w_2) = 2$ $d(w_3) = 2$ $d(w_4) =$

प्र. क्र.
Q. No.

$v_1 \longleftrightarrow \omega_1$ $\quad e_1 \longleftrightarrow e_8$

$v_2 \longleftrightarrow \omega_2$ $\quad e_2 \longleftrightarrow e_{10}$

$v_3 \longleftrightarrow \omega_4$ $\quad e_3 \longleftrightarrow e_6$

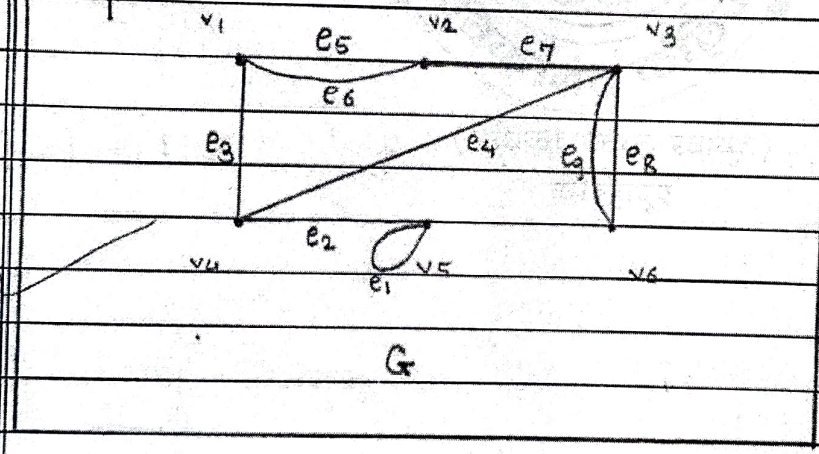
$v_4 \longleftrightarrow \omega_3$ $\quad e_4 \longleftrightarrow e_9$

$e_5 \longleftrightarrow e_7$

∴ The graph G_1 and G_2 are isomorphic

Q. 8.

ii] Graph :



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25100

(अधिकारप्रदत्त स्वायत्त)
कोल्हापूर

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर. (अधिकरप्रदत्त स्वायत्त)

परीक्षेच्या _____ या विषयाच्या प्रयोग परीक्षा

Practical Examination in, _____

at the _____ Examination

उमेदवराचा आसन क्रमांक _____ विभाग _____
(Candidate's Seat No.) (Section)

उमेदवारांना सूचना

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प्र. क्र.
Q. No.

Q. 2.

ii] $a_n - 5a_{n-1} + 6a_{n-2} = 7^n$

put $a_n = \alpha^n$

$\alpha^n - 5\alpha^{n-1} + 6\alpha^{n-2} = 0$

$\alpha^{n-2}\left[\alpha^2 - 5\alpha + 6\right] = 0$

$\alpha^2 - 5\alpha + 6 = 0$

प्र. क्र.
Q. No.

$\therefore \alpha^2 - 3\alpha - 2\alpha + 6 = 0$

$\alpha(\alpha-3) - 2(\alpha-3) = 0$

$(\alpha-3)(\alpha-2) = 0$

$\therefore \alpha = 3, 2$

$\therefore a_n^{(h)} = A_1(3)^n + A_2(2)^n$

To Find P.S.

$P_n = 7^n$

$a_n^p = P(7)^n$

$P(7)^n - 5P(7)^{n-1} + 6P(7)^{n-2} = 7^n$

~~$P(7)^{n-2}$~~ ~~P~~

$7^n \left[P - \frac{5P}{7} + \frac{6P}{7^2} \right] = 7^n$

(4)

$\frac{49P - 35P + 6P}{49} =$

$49P - 35P + 6P = 49$

$20P = 49$

$P = \frac{49}{20}$

$\therefore a_n^h = A_1(3)^n + A_2(2)^n + \frac{49}{20}(7)^n$

04 Section | Q. No. | Marks

प्र. क्र.
Q. No.

iii] $a_n + 5a_{n-1} + 6a_{n-2} = 0$.

Soln: $a_n + 5a_{n-1} + 6a_{n-2} = 0$

put $a_n = \alpha^n$

$\alpha^n + 5\alpha^{n-1} + 6\alpha^{n-2} = 0$.

$\alpha^{n-2} [\alpha^2 + 5\alpha + 6] = 0$

$\alpha^2 + 5\alpha + 6 = 0$.

$\alpha^2 + 3\alpha + 2\alpha + 6 = 0$

$\alpha(\alpha+3) + 2(\alpha+3) = 0$

$(\alpha+3)(\alpha+2) = 0$

$\therefore \alpha = -3, -2$.

$\therefore a_n^{(h)} = A_1(-3)^n + A_2(-2)^n$

$\therefore A_1$ & A_2 ,
const