

# Application of Edge Colouring In Scheduling of Examination Time Table and Duty Chart

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**ABSTRACT:** - Examination is one of the important steps in the evaluation of learner performance. All school has separate department for preparation of examination time table for the students and th duty chart for the conduct of examination. Examination department has to prepare of examination schedule in such a way that the teacher teaching multiple classes should get one of the paper in the first two days of examination. So that s/he can start evaluation of the answer papers with proper pace. And can justify the learner responses. Whereas while making duty chart for the examination one of the thing should keep in mind that teacher teaching the subjects shouldn't put on duty. This procedure is happening in all schools using trial and error method. But in this paper I have workout the same using concept of edge colouring of Graph theory. This is scientific procedure of getting solution to the scheduling of anything.

**KEYWORDS:** - Graph theory, edge colouring, examination time table, duty chart and scheduling.

## INTRODUCTION:-

Examination is one of the significant activities in school. For smooth conduction of examination, proper scheduling of all activities is important. Scheduling includes seating arrangement, arrangement of rooms, question papers setting, correction of answer papers etc. Out of all these factors assessment of answer papers is the most important part, hence every teacher should get the answer script on the first day of the examination. It helps in smooth correction work. In case of a teacher teaching different classes received all papers at once. Because of this teacher has to complete the correction very fast and there is a possibility of injustice with the student's responses. According to Patil S. et al. "assessment is the tail that wags the curriculum dog". The assessment must have proper blue print, questions of different types covering small answer type, long answer type etc. if such type of precaution is taken before the conduct of examination then one should think about providing sufficient time for the evaluation of the answer scripts. For this there is a need to give ample time for assessment for the development in Smart School – (SS) and not to ignore the importance of the assessment in the education system. To achieve this target we have to think new kind of scheduling which gives ample time for assessment. It will help the teacher to complete the work with stipulated time and also do the justice to the students who are writing the examination.

In this paper the preparation of examination time table and duty chart using edge colouring has been done.

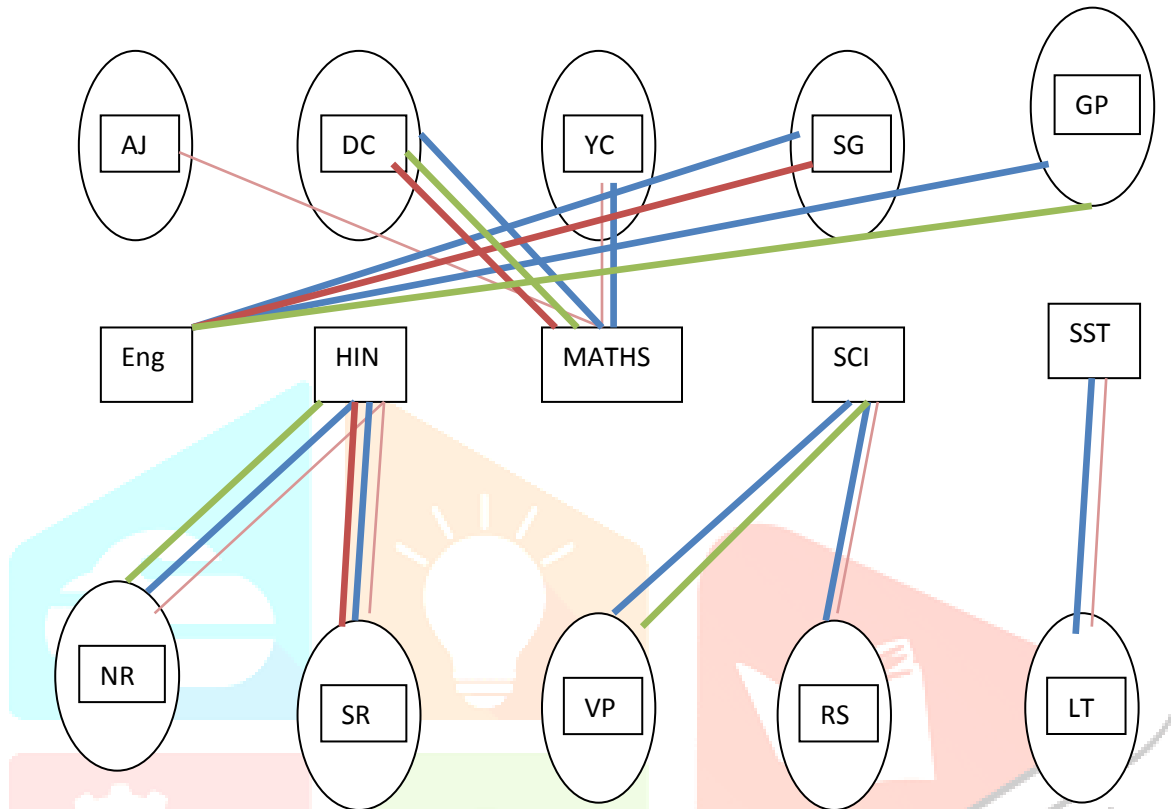
## Examination Time Table Scheduling – Problem Designing-

First we try to frame a time table for the Examination. Before preparation of Time Table we have to collect the data from the school. The following table gives the details about the Teacher teaching particular class and subject. Y is put in the table the teacher is teaching the particular subject in that class.

Teacher	Subjects	IX( )	X( )	XI( )	XII( )
AJ	Maths	Y			
DC	Maths		Y	Y	Y
YC	Maths	Y	Y		
SG	Eng		Y	Y	
GP	Eng		Y		Y
NR	Hindi	Y	Y		Y
SR	Hindi	Y	Y	Y	
VP	Science		Y		Y
RS	Science	Y	Y		
LT	SST	Y	Y		

The information given in the above table is first step in solving the problem. The first column represents teachers, second column represents subjects that particular teacher teaching in the respective class. Letter “Y” is marked in the column of classes where teacher is teaching that particular subject in the school. Rest of the columns kept empty. Time table should be scheduled in such a way that each teacher must get at least one of the answer script of any class on the first day of examination. It will help the teachers to give proper time for assessment of the students answer script. And the above said conflict gets solved.

Using above table the graph is drawn where teachers become vertex shown in circular form and subjects in rectangular form as follows:



**Fig 1** Pictorial representation of Examination scheduling

**Edge colouring** approach of graph is used to solve the problem. According to Golbert J.<sup>19</sup> edge colouring problems are omnipresent. It emphasizes on four colour map problem and gives solution to the baseball team scheduling. Scheduling gives the solution of the problem that number of games played in a day between the teams so as to complete the whole tournament in minimum number of days.

In our case vertex V denotes the teacher and V' is the representation of Subjects. Teacher (V) and subjects (V') are connected by different colours. Each colour is the representation of different class as shown in the table, for example blue for class X, red for class XI and so on.

From the graph we get the degree of vertices -V(teacher). The DC, NR and SR have highest degree as 3. While connecting the subject with teacher different colour of lines is used. Now select the vertex (teacher) who has maximum degree, start the examination with that subject. From the graph it is clear that we must keep papers of DC, NR and SR initially.

**First Day:** - SR-IX, VP and RS-X, DC – XI, NR-XII

Almost all other vertices has degree two in such cases, we have to analyze the graph further it shows that part of the graph is not connected. The teacher who has no connection with rest of the graph can be placed anywhere as they will not disturb while scheduling it.

**Second Day-** YC and AJ-IX, RS-X, GP-XII

**Third Day** - LT-IX, DC and YC- X, SR-XI and NR-XII

**Fourth Day** - RS-IX, LT-X, DC-X, SG-XI, GP-XII

**Fifth Day** - NR and SR-IX, SG and GP-X.

In this way the time table can be framed so that each teacher will get sufficient time for the assessment of student’s responses. And the justice is done not only with the students but also with teachers.

And hence problem is solved.

### Preparation of Duty chart for examination

#### Problem Designing

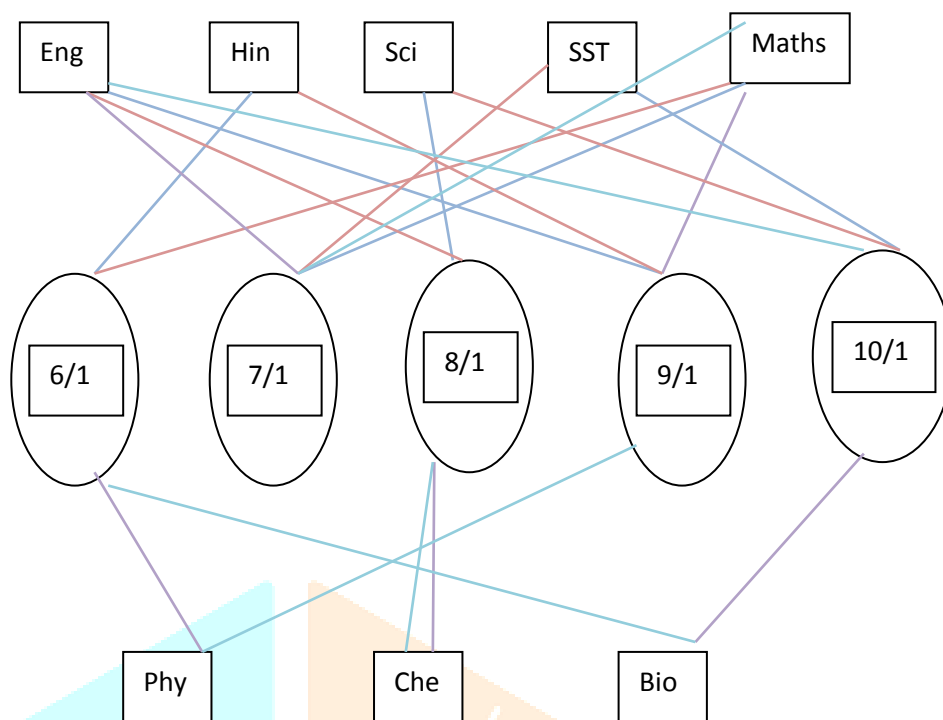
Every examination department in the school prepares the duty chart. But while designing it, teacher teaching the subject for that examination must be kept free, when the particular examination is conducted.

Let us consider examination time table.

Date	IX	X	XI	XII
6 <sup>th</sup> Jan	Hindi	Maths	Phy	Bio
7 <sup>th</sup> Jan	Maths	SST	Eng	Maths
8 <sup>th</sup> Jan	Science	Eng	Che	Che
9 <sup>th</sup> Jan	Eng	Hindi	Maths	Phy
10 <sup>th</sup> Jan	SST	Science	Bio	Eng

The above table is time table is for the Examination. This is distributed to the students. Now it is the duty of examination committee to arrange teachers to put on duty for invigilation, and prepare the duty chart. While doing this examination department have to keep the teacher free on the day of examination when his/her subject is schedule in the time table. This can be achieved with the help of edge colouring concept of graph theory.

Set the given information graphically. In the rectangular boxes different subjects are written and in the circular boxes dates of examination are written. Now connect the date and subject by different colour of paths as shown in the following figure.



**Fig 2** Graphical representation of time table

This is a Graphical representation of the time table. Now the next step is to allocate the duties on the particular day. Connecting the date and subjects by different colours which is represented as above. The different colours in the graph are the representation for the different classes. Our main concern is that on the particular day the teacher teaching to the subject should not assign the duties. From the graph find the vertex with **least degree**. And the same teachers are deputed on the duty. For example- 6<sup>th</sup> Jan is **not** connected to Eng, Sci, Che. So we have to assign the duties to that particular teacher's. Similarly on 7<sup>th</sup> Jan is not connected to Sci, Phy and Bio so the particular teacher must be assigned on duty. Using above strategy following table can be prepared.

Date	Teacher's (subjects)
6 <sup>th</sup> Jan	Eng, Sci and Che
7 <sup>th</sup> Jan	Sci, Phy and Bio
8 <sup>th</sup> Jan	Hindi, SSt, Bio, Maths and Phy
9 <sup>th</sup> Jan	SSt, Sci, Phy and Bio
10 <sup>th</sup> Jan	Maths, Hin, Che and Phy

In this way we solved the issue and free teacher's list will be ready. Once the above table is ready then from the table prepare another table given below. This is representation of the teacher teaching to the particular subject.

Subjects	Eng	Hin	S St	Che	Phy	---
Teacher	GP	NR	LT	PD	MD	
	SG	SR	MG	RS	YC	

Keep the teacher's teaching English, Science and Chemistry free on 6<sup>th</sup> Jan and assign the duties to the remaining teachers. The same procedure is followed further and the time table can be prepared.

This way the problem is solved.

**CONCLUSION:-** Edge colouring is the scientific method of designing the scheduling of any activity. In this paper we have used the same technique to solve the process of examination such as Examination time table preparation and Duty chart preparation. In most of the school follows the trial and error approach of preparation of time table. In this paper we solve the problems by the method which is mathematical as well as logically true.

**REFERENCES:-**

- [1] Thang S., Carol H., Azman H., Gordon J. (2010). Supporting Smart School Teachers. Continuing professional development in and through ICT: a model for change, International Journal of Education and Development using Information and Communication Technology, 6(2), 5-20
- [2] Bruce F., Jeffrey M., Vincent, Deborah M., and Ariel H. Bierbaum (2009). Smart Schools, Smart Growth, Policy Analysis for California Education and center for cities and schools,09 (01), 1-27.
- [3] Tutte W. (1984). Graph Theory, Hardback edition publication by Addison Wesley
- [4] Patil S., Gosavi M., Bannur H. and Ratnakar A.(2015), Blue print in assessment : A tool to increase the validity of undergraduate written examination in pathology, International Journal of Applied and Basic Medical Research, 5(1), S76-S79.
- [5] Leighton F.(1979), A graph colouring algorithm for large scheduling problem, Journal of research of the National bureau of standards, 84(6), 1-18.
- [6] Casselgren C.(2011), On some graph colouring problems, Department of Mathematical statistics, Umea University, Sweden.
- [7] Gilbert J.(2002), Strategies for multi-graph edge colouring, Johns Hopkins APL technical digest , 23,2-3.