Programme Syllabus Booklet

Doctor of Philosophy in Fruit Science

(Ph.D. Fruit Science- 584)

Session: 2022-23

GURU KASHI UNIVERSITY
PUNJAB - INDIA

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Program: Doctor of Philosophy Fruit Science

Program Outcome: The Program Outcomes for Doctor of Philosophy Fruit Science (Ph.D. Fruit Science) are following:

PO	Fruit Science Doctorate will be able to:
PO1	The program is effectively designed to appraise the principles and methodologies used in Fruit Science. To provide basic information regarding, taxonomy, classification, propagation, breeding and post harvest care of fruit crops.
PO2	The program provides deep insight of density planting, crop modeling , Precision farming, in major fruit crops of india.
PO3	The program helps to study advances in crop improvement efforts- introduction and selection, chimeras, apomixis, clonal selections, intergeneric, interspecific and intervarietal hybridization in major fruit crops.
PO4	To provide advanced knowledge on self incompatibility in various fruit varieties of different crops.
PO5	To provide knowledge in the merits and demerits of breeding fruit crops.
PO6	The course imparts knowledge on various methods/techniques/instruments used in the study of plant propagation through different means.
PO7	The program helps in analyzing aspects of crop regulation- physical and chemical regulation effects on physiology and development.
PO8	To provide knowledge on , Total quality management(TQM) - Current topics of major fruit crops.
PO9	The program designed to provide knowledge on the Evolutionary mechanisms, adaptation and domestication, Genetic resources, cytogenetics, cytomorphology, chemotaxonomy.
PO10	To impart knowledge to the students on principles and practices of integrated disease/ pest management in different crops.
PO11	To provide knowledge on genetics of important traits and their inheritance pattern, variations and natural selection, spontaneous mutations
PO12	Statistical principles apply in all the areas of experimental work and they have a very important role in agriculture, decision making, agriculture development and estimates disease occurrence and control.

Program Specific Outcome: The Program Specific Outcome for Doctor of Philosophy Fruit Science (Ph.D Fruit Science) are following:

PSO	Fruit Science Doctorate will be able to:
PSO1	The program provides knowledge of basics and advances of breeding in fruit crops like mango. Citrus, apple, guava, papaya.
PSO2	The program effectively deals with the production technology, cultivation and after care of fruits.
PSO3	Student will be equipped with the knowledge of economic importance, cultivation practices of temperate, tropical, sub-tropical and dryland fruit crops.

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Study Scheme:

Flexible Study Scheme										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	584101	Research Methodology	T	4	0	0	4	50	50	100
2	180104	Research and Publication Ethics	T/P	1	0	2	2	50	50	100
3	584102	Advances in Breeding & Production Technology of Fruit Crops	T	4	0	0	4	50	50	100
4	584103	Seminar	P	NA	NA	NA	2	100	NA	100
Elective Subject-I										
5	180102	Computer Applications in Research	T/P	1	0	2	2	100	NA	100
6	180105	Statistical Methods	T	3	0	0	3	50	50	100
7	180106	Technical Writing, Communication Skills and Library and Information Services	T	3	0	0	3	50	50	100
Total No. of Credits				14/15						

Course Name: Research Methodology

Course Code: 584101

Semester: 1st

Credit: 4

L	T	P
4	0	0

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Research Methodology
CO1	Organize, manage and present data
CO2	Analyze statistical data graphically using frequency distributions and cummulative frequency distributions
CO3	Analyze statistical data using measures of central tendency, dispersion and location
CO4	Estimate the elements of linear estimation, Analysis of variance and covariance.
CO5	CRD , RBD and other research designs

Course content

Unit-I Research: Objectives of Research, Research Methodology and Selection of research problem.

Unit -II Research Designs: Completely randomized, Randomized block, Latin Square, Split Plot, Split-split plot and Factorial Experimental Design and their applications.

Unit-III Tabulation and interpretation of horticultural research data: Statistical analysis of above said designs with examples.

Unit-IV Other Statistical Methods in horticulture research: Objectives and uses of Correlation and Regression , Multiple Regression and Path coefficient analysis in horticulture. Tabulation, processing and interpretation by these methods.

Unit- V Parametric tests :t, z and F testsand Chi Square test. Analysis of Variance

Unit- VI Report Writing and Presentation: Types of reports, Report Format – Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation.

The mapping of PO/PSO/CO attainment is as follows:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2	3	1	1	2	1	2	1	2	1	3	2	2	2

CO2	1	2	1	2	1	2	1	1	2	1	1	3	1	2	3
CO3	2	1	1	3	2	1	2	1	1	3	1	3	1	2	2
CO4	2	3	3	2	1	1	1	1	3	2	1	3	2	2	2
CO5	2	1	1	2	2	1	2	1	2	3	1	3	1	2	3
Average	1.6	1.8	1.8	2.0	1.4	1.4	1.4	1.2	1.8	2.2	1.0	3.0	1.4	2.0	2.4

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Suggested reading:

1. Gomez K A & Gomez A A, *Statistical procedures for agriculture research. 2nd edn.* John Wiley and Sons, New York . U.K.
2. Kothari C.K. (2004), *Research Methodology- Methods and Techniques* " (New Age International, New Delhi)
3. Panse VG and PV Sukhatme *Statistical methods for agricultural workers.*
4. R. Rangaswamy, "A textbook of Agricultural statistics"

Course Name: Advances in breeding and production technology of fruit crops

Course Code: 584102

Semester: 1st

Credit: 4

L T P
4 0 0

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Evolutionary mechanisms, adaptation and domestication, Genetic resources, cytogenetics, cytomorphology, chemotaxonomy, ,
CO1	genetics of important traits and their inheritance pattern, variations and natural selection, spontaneous mutations
CO2	incompatibility systems in fruits , Total quality management(TQM) - Current topics of the following crops
CO3	recent advances in crop improvement efforts- introduction and selection, chimeras, apomixis, clonal selections, intergeneric, interspecific and intervarietal hybridization,
CO4	High density planting, crop modeling , Precision farming, decision support systems - aspects of crop regulation-, integrated and modern approaches in water and nutrient management, ,
CO5	physical and chemical regulation effects on physiology and development, influence of stress factors, strategies to overcome stress effects

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Course content

Objective

To update knowledge on the recent research trends in the field of breeding of fruit crops with special emphasis on tropical, subtropical and temperate crops grown in India.

To keep abreast with latest developments and trends in production technology of fruit crops.

Theory

Evolutionary mechanisms, adaptation and domestication, Genetic resources, cytogenetics, cytomorphology, chemotaxonomy, genetics of important traits and their inheritance pattern, variations and natural selection, spontaneous mutations, incompatibility systems in fruits , recent advances in crop improvement efforts- introduction and selection, chimeras, apomixis, clonal selections, intergeneric, interspecific and intervarietal hybridization, mutation and polyploid breeding, resistance breeding to biotic and abiotic stresses, breeding for improving quality, molecular and transgenic approaches in improvement of selected fruit crops.

National and International scenario in fruit production, Recent advances in propagation - root stock influence, planting systems, High density planting, crop modeling , Precision farming, decision support systems - aspects of crop regulation- physical and chemical regulation effects on physiology and development, influence of stress factors, strategies to overcome stress effects, integrated and modern approaches in water and nutrient management, , Total quality management(TQM) - Current topics of the following crops:

UNIT I : Mango and banana
UNIT II: Papaya, grapes and citrus
UNIT III: Guava and sapota
UNIT IV: Pineapple and avocado
UNIT V**:** Apple, pear, plums, peaches, apricot, cherries and strawberry
UNIT VI: Pomegranate, aonla Jack fruit and fig (only production)

The mapping of PO/PSO/CO attainment is as follows:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	1	1	1	2	2	2	1	2	1	3	3	2	2
CO2	2	2	1	2	2	2	1	1	2	1	2	3	2	2	2
CO3	2	2	2	3	2	1	2	2	1	3	1	2	1	3	2
CO4	2	1	2	2	1	2	3	1	3	2	2	3	2	1	1
CO5	2	2	2	2	2	1	2	2	2	3	2	2	3	2	3

Average	2.0	1.8	1.6	2.0	1.6	1.6	2.0	1.6	1.8	2.2	1.6	2.6	2.2	2.0	2.0

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Suggested Readings :

- Bose TK, Mitra SK & Sanyol D. (Ed.). 2002. *Fruits of India – Tropical and Sub-tropical*. 3rd Ed. Vols. I, II. Naya Udyog.
- Radha T & Mathew L. 2007. *Fruit Crops*. New India Publ. Agency.
- Singh S, Shivankar VJ, Srivastava AK & Singh IP. (Eds.). 2004. *Advances in Citriculture*. Jagmander Book Agency.
- Stover RH & Simmonds NW. 1991. *Bananas*. Longman.

Course Name: Seminar

Course Code: 584103

Semester: 1st

Credit: 2

L	T	P
0	0	0

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Show competence in identifying relevant information, defining and explaining topics under discussion
CO2	Present the classical and innovative work related to fruit science subject.
CO3	Reach across diverse disciplines to apply theories, methods and knowledge bases from multiple fields to a single question or problem
CO4	Judge when to speak and how much to say, speak clearly and audibly in a manner appropriate to the subject
CO5	To ask appropriate questions, use evidence to support claims, respond to a range of questions

Course content

Seminar topic will be suggested by faculty.

The mapping of PO/PSO/CO attainment is as follows:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2	PSO 3

CO1	2	2	1	3	3	1	1	1	1	1	2	3	2
CO2	1	1	2	2	1	1	3	2	1	2	1	2	2
CO3	1	2	2	1	2	1	1	2	2	1	2	2	1
CO4	2	2	1	1	2	2	1	1	2	3	2	1	2
CO5	3	2	1	3	3	2	3	2	3	3	2	3	3
Average	1.8	1.8	1.4	2.0	2.2	1.4	1.8	1.6	1.8	2.0	1.8	2.2	2.0

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Computer Applications in Research

Course Code: 180102

Semester: 1st

L T P

Credits: 01 **0 0 2**

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Computer Applications in Research
CO1	Learn & understand basics of MS-Word, Excel, preparation of Graphs
CO2	Dissect a scholarly article, Use a scholarly article's bibliography to pursue other sources
CO3	Students will be familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
CO4	Students will be able to read, understand, and interpret material on technology. They will have an appreciation for some of the ideas, issues, and problems involved in writing about technology and in workplace writing.
CO5	Students will be familiar with basic sources and methods of research and documentation on topics in technology, including on-line research. They will be able to synthesize and integrate material from primary and secondary sources with their own ideas in research papers.

Course content

Common for all branches except Hindi, Punjabi, English, History and Religious Study.

Unit 1

Generating Charts/Graphs in Microsoft Excel, Power Point Presentation, Web search, Use of Internet and www. Using search like Google etc.

Unit 2:

SPSS concepts and its use for Statistical Analysis.

Unit 3:

MatLaband its use for Statistical Analysis.

Unit 4:

Introduction to the use of LaTeX, Mendeley, Anti-Plagiarism Softwares .

References:-

1) Office 2007 in Simple Steps, Kogent Solutions, (Wiley Publishers).
2) MS-Office 2007 Training Guide, S. Jain (BPB Publications).
3) Bansal , R. K. and others 'MATLAB and its applications in Engg. Second Edition , Pearson Education, Delhi.

The mapping of PO/PSO/CO attainment is as follows:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	2	3	3	2	1	1	1	1	3	2	1	3	2	2	2
CO 2	2	1	1	2	2	1	2	1	2	3	1	3	1	2	1
CO 3	1	2	1	3	1	2	2	1	1	3	1	3	1	1	2
CO 4	2	3	2	2	2	1	2	1	1	3	1	3	1	1	3
CO 5	2	1	2	3	1	1	2	3	1	3	1	3	1	2	2

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Research and Publication Ethics

Course Code: 180104

Semester: 1st

Credit: 2

L	T	P
2	0	0

CO	Research and Publication Ethics
CO1	Learn & understand Introduction to philosophy and ethics: definition, nature and scope, concept, branches and reactions
CO2	Identification of publication misconduct, complaints and appeals to predatory publishers and journals
CO3	Students will be familiar with Indexing databases, Citation databases: Web of Science, Scopus,etc.
CO4	Students will be able to read, understand, and interpret material on technology. They will have an open access publications and initiatives and software tool to identify predatory publications developed by SPPU
CO5	To understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact Factor, etc.). To understand the usage of plagiarism tools.

THEORY

- **RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)**

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

- **RPE 02: SCIENTIFICCONDUCT (5hrs.)**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

- **RPE 03: PUBLICATION ETHICS (7 hrs.)**

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest

4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
5. Violation of publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICE

- **RPE 04: OPEN ACCESS PUBLISHING (4 hrs.)**
  1. Open access publications and initiatives
  2. SHERPA/ROMEO online resource to check publisher copyright & self-archiving policies
  3. Software tool to identify predatory publications developed by SPPU
  4. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

- **RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

A. Group Discussions (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs.)

Use of plagiarism software like Turnitin, Urkund and other open source software tools

- **RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)**

A. Databases (4 hrs.)

1. Indexing databases
2. Citation databases: Web of Science, Scopus,etc.

B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g-index, i10 index, altmetrics

The mapping of PO/PSO/CO attainment is as follows:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3
CO1	2	2	1	1	2	2	1	2	1	2	1	1	2
CO2	1	3	1	3	1	3	3	1	2	1	1	2	1
CO3	1	2	2	2	2	1	1	1	1	3	2	1	1
CO4	2	1	1	1	1	2	2	2	1	2	2	3	2
CO5	1	2	2	3	1	2	1	2	2	2	1	1	3

Average	1.4	2.0	1.4	2.0	1.4	2.0	1.6	1.6	1.4	2.0	1.4	1.6	1.8

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Elective Subjects

Course Name: Statistical Methods
Course Code: 180105
Semester: 1st

Credit: 3 **L T P**
3 0 0

Course Outcomes: On completion of this course, the successful students will able to:

CO	Statement
CO1	Formulate complete, concise, and correct mathematical proofs.
CO2	Frame problems using multiple mathematical and statistical representations of relevant structures and relationships and solve using standard techniques.
CO3	Understand concepts include probability distributions, statistical significance, hypothesis testing, and regression.
CO4	Study the importance of statistics in agriculture, helps to ascertain the volume of crop that needs to be produced based on output and demand of previous year
CO5	Assess the strengths of the conclusions and evaluating their uncertainty.

Course Content

Probability distribution: uniform, binomial, Poisson, geometric, hyper geometric, negative binomial, multinomial, normal, exponential, Cauchy, Gamma, Beta, Weibull, log normal, logistic and Pareto. Compound and truncated distributions. Central and non-central z, t and F. Bivariate normal. Distribution of quadratic forms and r-th order statistic. Practical: Random experiments. Moments. Correlation and regression. Fitting of: binomial, Poisson, normal, hyper geometric and negative binomial. Truncated binomial and Poisson. Log normal.

Suggested Readings

1. Panse, V.G. and Sukhatme, P.V. 1954. *Statistical methods for agricultural workers.* pp. 361.
2. Gupta, S.C. and Kapoor, V.K. 2014. *Fundamentals of Mathematical Statistics.* Sultan Chand & Sons, New Delhi.pp. 230.
3. Snecdecor, G.W. and Cochran, W.G. 1989. *Statistical Methods,* 8th Edition. Wiley-Blackwell. Pp.524.

4. Rangaswamy, R. 2016. *Textbook of Agricultural Statistics.*New Age International (P) Ltd. New Delhi. pp. 531.

The mapping of PO/PSO/CO attainment is as follows:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3
CO1	2	3	3	2	1	1	1	1	3	2	2	2	2
CO2	2	1	1	2	2	1	2	1	2	3	1	2	3
CO3	1	2	1	3	1	2	2	1	1	3	1	1	2
CO4	2	3	2	2	2	1	2	1	1	3	1	1	1
CO5	2	1	2	3	1	1	2	3	1	3	1	2	2
Averag e	1.8	2.0	1.8	2.2	1.4	1.2	1.8	1.4	1.6	2.4	1.2	1.6	2.0

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name:Technical Writing, Communication Skills and Library and Information Services

Course Code: 180106

Semester: 1st

Credits: 02 **L T P**

1 0 2

Course Outcomes: On successful completion of this course, the students will be able to

CO	Statement
CO1	Understand the professional writing by studying management communication contexts and genres, researching contemporary business topics, analyzing quantifiable data discovered by researching, and constructing finished professional workplace documents.
CO2	Recognize, explain, and use the formal elements of specific genres of organizational communication: white papers, recommendation and analytical reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents.
CO3	Understand the ethical, international, social, and professional constraints of audience, style, and content for writing situations a) Among managers or co-workers and colleagues of an organization, and b) between organizations, or between an organization and the public.
CO4	Learn how to apply technical information and knowledge in practical documents for a variety of a) Professional audiences (including peers and colleagues or management) and b) public audiences.
CO5	Develop a professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors and Service Learning contact representatives.

Course Contents

Theory: Technical Writing-Various forms of technical writing-theses, technical papers, reviews, electronic communication etc; qualities of technical writing; parts of research communications- title page, content page, authorship, preface, introduction, review of literature,

materials and methods, experimental results, documentation; photographs and drawings with suitable captions; pagination; citations; writing of abstracts; précis; synopsis; editing and proof reading.

Communication Skills-defining communication; types of communication- verbal and non-verbal; assertive communication; assertive 445 communication; using language for effective communication; techniques of dyadic communication- message pacing and message chunking, self disclosure, mirroring, expressing conversational intent; paraphrasing; vocabulary building-word roots, prefixes, Greek and Latin roots.

Practical: Editing and Proof reading technical articles; using language tools for effective writing; listening to audio-video conversations aimed at testing the comprehension of the students; oral presentations on a given topic related to agriculture; evaluation of body language and communication skills based on group discussions and interviews; role plays and pronunciation exercises; using eye contact and visual clues for effective listening skills; word stress application and voice modulation; soft skills; rhetoric skills; self-assessment exercises.

Introduction to Library and its services; Five laws of library science; type of documents; classification and cataloguing; organization of documents; sources of information-primary, secondary and tertiary; current awareness and SDI services; tracing information from reference sources; library survey; preparation of bibliography; use of Online Public Access Catalogue; use of CD-ROM databases and other computerized library services, CeRA, J-Gate; use of Internet including search engines and its resources; e-resources and access methods.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO /CO	**P O1**	**P O2**	**P O3**	**P O4**	**P O5**	**P O6**	**P O7**	**P O8**	**P O9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	3	3	2	1	3	1	2	1	2	3	2	1	2	2
CO2	2	2	1	1	3	2	3	2	2	3	2	2	2	1	1
CO3	2	3	2	2	1	2	2	-	-	1	2	1	2	1	2
CO4	3	1	1	1	1	3	3	1	2	2	2	1	1	1	2
CO5	3	1	2	2	1	2	1	1	1	1	2	1	2	1	1
Average	**2.6**	**2**	**1.8**	**1.6**	**1.4**	**2.4**	**2**	**1.2**	**1.2**	**1.8**	**2.2**	**1.4**	**1.6**	**1.2**	**1.6**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Total Number of Course	5
Number of Theory Course	10
Number of Practical Course	4
Total Number of Credits	**14**

Annexure-4

ACADEMIC INSTURCTIONS

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

For Theory

	Internal (50)						**External (50)**	**Total**
Components	**Attendance**	**Assignment**			**MST 1**	**MST2**	**ETE**	
		A1	A2	A3				
Weightage	10	10	10	10	30	30	50	
Average Weightage	10	10			30		50	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.