

*Information Brochure*

# GATE 2012

Graduate Aptitude Test in Engineering



Organizing Institute  
Indian Institute of Technology Delhi

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## 1. General Information

Graduate Aptitude Test in Engineering (GATE) is an all India examination administered and conducted jointly by the Indian Institute of Science and seven Indian Institutes of Technology on behalf of the National Coordination Board - GATE, Department of Higher Education, Ministry of Human Resource Development (MHRD), Government of India.

The GATE committee, which comprises of representatives from the administering institutes, is the sole authority for regulating the examination and declaring the results.

### 1.1. Zonal Administering Institutes

GATE is conducted through the constitution of eight zones. The zones and the corresponding administering institutes are:

- Zone 1 - Indian Institute of Science Bengaluru
- Zone 2 - Indian Institute of Technology Bombay
- Zone 3 - Indian Institute of Technology Delhi
- Zone 4 - Indian Institute of Technology Guwahati
- Zone 5 - Indian Institute of Technology Kanpur
- Zone 6 - Indian Institute of Technology Kharagpur
- Zone 7 - Indian Institute of Technology Madras
- Zone 8 - Indian Institute of Technology Roorkee

The examination cities and the contact details of the zonal administering institutes are given in Table 1.

The overall coordination and responsibility of conducting GATE 2012 lies with **Indian Institute of Technology Delhi**, designated as the **Organizing Institute for GATE 2012**.

### 1.2. Eligibility for GATE

The following categories of candidates **ONLY** are eligible to appear for GATE:

- a) Bachelor's degree holders in Engineering/Technology/ Architecture (4 years after 10+2) and those who are in the **final year** of such programmes.
- b) Bachelor's degree holders in Engineering/Technology/Architecture (Post-B.Sc./Post-Diploma) and those who are in the **final year** of such programmes.
- c) Master's degree holders in any branch of Science/Mathematics/ Statistics/Computer Applications or equivalent and those who are in the **final year** of such programmes.
- d) Candidates in the **second or higher year** of the Four-year Integrated Master's degree programme (Post-B.Sc.) in Engineering/Technology.
- e) Candidates in the **fourth or higher year** of Five-year Integrated Master's degree programme or Dual Degree programme in Engineering/Technology.
- f) Candidates with qualifications obtained through examinations conducted by professional societies recognized by UPSC/AICTE (e.g. AMIE by Institute of Engineers (India); AMICE by Institute of Civil Engineers (India)) as equivalent to B.E./B.Tech. Those who have completed section A or equivalent of such professional courses are also eligible.

### 1.3. GATE Qualification

Admission to postgraduate programmes with MHRD and some other Government scholarships/assistantships in engineering colleges/institutes is open to those who qualify in GATE examination. Candidates with Bachelor's degree in Engineering/Technology/Architecture or Master's degree in any branch of Science/Mathematics/Statistics/Computer Applications, who qualify in GATE examination are eligible for admission to Master's degree programmes in Engineering/Technology/ Architecture as well as for Doctoral programmes in relevant branches of Science with MHRD or other Government scholarships/assistantships. To avail the scholarship, the candidate must secure admission to such a postgraduate programme, as per the prevailing procedure of the admitting institution. However, candidates with Master's degree in Engineering/Technology/Architecture may seek admission to relevant Doctoral programmes with scholarship/assistantship without appearing in the GATE examination.

Qualification in GATE is also a minimum requirement to apply for various fellowships awarded by many Government organizations.

Table 1: Examination cities and contact details of the zonal GATE offices

Zones	Examination cities for		Contact details
	ONLINE Exam	OFFLINE Exam	
<b>Zone 1</b>	Bengaluru Hyderabad Mangalore	Ananthapur, Bagalkot, Belgaum, Bengaluru, Davangere, Hassan, Hubli, Hyderabad, Kurnool, Mahabubnagar, Mangalore, Mysore, Secunderabad and Surathkal	Chairman, GATE Indian Institute of Science Bengaluru 560 012 Phone: 080-2293 2392 Fax: 080-2360 1227 E-mail: gate@gate.iisc.ernet.in
<b>Zone 2</b>	Ahmedabad Mumbai Pune	Ahmedabad, Ahmednagar, Akola, Amravati, Aurangabad, Bhusawal, Goa, Gondia, Gulbarga, Jalgaon, Kolhapur, Latur, Lonavala, Loni, Mahesana, Mumbai, Nagpur, Nanded, Nashik, Navi Mumbai, Pandharpur, Pune, Rajkot, Sangli, Satara, Shegaon, Solapur, Surat, Thane, Vadodara, and Wardha	Chairman, GATE Indian Institute of Technology Bombay, Powai, Mumbai 400 076 Phone: 022-2576 7068 Fax: 022-2572 3706 E-mail: gateoffice@iitb.ac.in
<b>Zone 3</b>	Delhi Gurgaon Jaipur	Ajmer, Alwar, Bikaner, Delhi Central, Delhi East, Delhi North, Delhi South, Delhi West, Faridabad, Gurgaon, Indore, Jaipur, Jammu, Jodhpur, Sikar, Udaipur, and Ujjain	Chairman, GATE Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 Phone: 011-2659 1749 Fax: 011-2658 1579 E-mail: gateoffice@admin.iitd.ac.in
<b>Zone 4</b>	Durgapur Guwahati Patna	Agartala, Asansol, Bhagalpur, Dhanbad, Durgapur, Gangtok, Guwahati, Imphal, Itanagar, Jorhat, Kalyani, Patna, Silchar, Siliguri, and Tezpur	Chairman, GATE Indian Institute of Technology Guwahati, Guwahati 781 039 Phone: 0361-258 2751 Fax: 0361-258 2755 E-mail: gate@iitg.ernet.in
<b>Zone 5</b>	Allahabad Kanpur Lucknow	Agra, Aligarh, Allahabad, Bareilly, Bhopal, Gorakhpur, Gwalior, Jabalpur, Jhansi, Kanpur, Lucknow, Saugar (Sagar, MP), Sultanpur and Varanasi	Chairman, GATE Indian Institute of Technology Kanpur, Kanpur 208 016 Phone: 0512-259 7412 Fax: 0512-259 0932 E-mail: gate@iitk.ac.in
<b>Zone 6</b>	Kolkata, Vijayawada Visakhapatnam	Balasore, Berhampur (Orissa), Bhimavaram, Bhubaneswar, Bilaspur, Cuttack, Eluru, Jamshedpur, Kakinada (AP), Kharagpur, Kolkata, Machilipatnam, Raipur, Rajahmundry, Ranchi, Rourkela, Sambalpur, Srikakulam, Tadepalligudem, Vijayawada and Visakhapatnam	Chairman, GATE Indian Institute of Technology Kharagpur, Kharagpur 721 302 Phone: 03222-282091 Fax: 03222-278243 E-mail: gate@adm.iitkgp.ernet.in
<b>Zone 7</b>	Chennai Coimbatore Ernakulam	Bapatla, Chennai North, Chennai South, Chidambaram, Chittoor, Coimbatore, Dindigul, Ernakulam, Gudur, Guntur, Kadapa, Kannur (Kerala), Karimnagar, Khammam, Kollam, Kothagudem, Kottayam, Kozhikode, Madurai, Manchiryal, Nagercoil, Nalgonda, Nellore, Ongole, Palakkad, Puducherry(Pondicherry), Salem, Tenali, Thanjavur, Thiruvananthapuram, Thrissur, Tiruchirapalli, Tirunelveli, Tirupati and Warangal	Chairman, GATE Indian Institute of Technology Madras, Chennai 600 036 Phone: 044-2257 8200 Fax: 044-2257 8204 E-mail: gate@iitm.ac.in
<b>Zone 8</b>	Chandigarh Noida Roorkee	Amritsar, Bathinda, Bijnor, Chandigarh, Dehradun, Ghaziabad, Haldwani, Hamirpur (HP), Haridwar, Hisar, Jalandhar, Kota, Kurukshetra, Ludhiana, Mathura, Meerut, Muzaffarnagar, Noida, Patiala, Rohtak, Roorkee, Shimla and Yamunanagar	Chairman, GATE Indian Institute of Technology Roorkee, Roorkee 247 667 Phone: 01332-284531 Fax: 01332-285707 E-mail : gate@iitr.ernet.in

Note: GATE 2012 Committee may drop any place as examination city at its discretion

## 1.4. Postgraduate Admissions with MHRD Scholarship

As per the directives of the MHRD, the following procedure is to be adopted for admission to the postgraduate programmes (Master and Doctoral) with MHRD scholarship/assistantship. The performance of the candidate in GATE will be considered for admission. If the candidate is to be selected through interview for postgraduate programmes, minimum 70% weightage is to be given to the performance in GATE. The remaining weightage (30% maximum) can be given to the candidate's academic record or performance in interview. The admitting institution could however prescribe minimum passing percentage of marks in the interview. Some colleges/institutes specify GATE qualification as the mandatory requirement even for admission without MHRD scholarship/assistantship.

Candidates are advised to seek details of admission procedures and availability of MHRD scholarship/assistantship from the concerned admitting institution. The criteria for postgraduate admission with scholarship/assistantship are different for different admitting institutions. The management of the postgraduate scholarship/assistantship is also the responsibility of the admitting institution. Similarly, reservation of seats under different categories is as per the policies and norms prevailing at the admitting institution and Government of India rules. GATE offices will not entertain any enquiry about admission, reservation of seats or award of scholarship/assistantship.

A candidate declared "Qualified in GATE at the time of admission" is entitled for MHRD fellowship for 24 months unless he/she loses it due to poor performance in the registered programme. The students of Integrated Master Degree and Dual Degree programmes in Engineering/Technology are eligible to appear in GATE 2012 in order to qualify for the postgraduate scholarships in their own institutions only. They are not eligible for admission to a fresh M.E./M.Tech. programme.

## 1.5 Application Submission Process

- a) Candidates need to apply/register ONLINE for GATE 2012. Application process for GATE 2012 is **entirely ONLINE**, and sale of application forms through banks / GATE office counters has been discontinued. Details for applying ONLINE are available on the websites of IISc and the seven IITs as given below in Table 2.

Table 2: Websites of IISc and IITs

ZONE	WEBSITE
IISc Bengaluru	gate.iisc.ernet.in
IIT Bombay	www.iitb.ac.in/gate
IIT Delhi	http://gate.iitd.ac.in/GATE
IIT Guwahati	www.iitg.ernet.in/gate
IIT Kanpur	www.iitk.ac.in/gate
IIT Kharagpur	gate.iitkgp.ac.in
IIT Madras	gate.iitm.ac.in
IIT Roorkee	www.iitr.ac.in/gate

- b) The application fee is Rs.1000/- for General/OBC Category candidates and Rs.500/- for SC/ST/PD\* Category candidates. The application fee is non-refundable.

\*Person with Disability

## 2. Structure of GATE 2012

### 2.1. Examination Papers

**A candidate can apply for only ONE of the 21 papers listed in Table 3.** The syllabi of all the papers are given in the GATE websites of IISc and IITs given in Table 2. Making a choice of the appropriate paper is the responsibility of the candidate. Some guidelines in this respect are suggested below.

The candidate is expected to appear in a paper appropriate to the discipline of his/her qualifying degree. The candidate is, however, free to choose any paper according to his/her admission plan, keeping in mind the eligibility criteria of the institutions in which he/she wishes to seek admission.

Table 3: List of GATE papers and corresponding codes

PAPER	CODE	PAPER	CODE
Aerospace Engineering	AE	Instrumentation Engineering	IN
Agricultural Engineering	AG	Mathematics	MA
Architecture and Planning	AR	Mechanical Engineering	ME
Biotechnology	BT	Mining Engineering	MN
Civil Engineering	CE	Metallurgical Engineering	MT
Chemical Engineering	CH	Physics	PH
Computer Science and Information Technology	CS	Production and Industrial Engineering	PI
Chemistry	CY	Textile Engineering and Fibre Science	TF
Electronics and Communication Engineering	EC	Engineering Sciences	XE*
Electrical Engineering	EE	Life Sciences	XL*
Geology and Geophysics	GG		
XE PAPER SECTIONS	CODE	XL PAPER SECTIONS	CODE
<i>Engineering Mathematics (Compulsory)</i>	<b>A</b>	<i>Chemistry (Compulsory)</i>	<b>H</b>
Fluid Mechanics	B	Biochemistry	I
Materials Science	C	Botany	J
Solid Mechanics	D	Microbiology	K
Thermodynamics	E	Zoology	L
Polymer Science and Engineering	F	Food Technology	M
Food Technology	G		

\* XE (Engineering Sciences) and XL (Life Sciences) papers are of general nature and will comprise of the sections listed in the above table. A candidate appearing in XE or XL paper will be required to answer three sections apart from the General Aptitude (GA) questions. Section A is compulsory in XE paper and Section H is compulsory in XL paper. The candidate can choose any two out of the remaining sections listed under the respective papers, at the time of examination.

## 2.2. Examination Schedule and Cities

GATE 2012 Examination will include both ONLINE and OFFLINE examinations as per the following schedule:

Examination Type	Examination Cities	Examination Date (Day)	Examination Time	GATE Paper Codes
ONLINE	Listed in Table 1	<b>January 29, 2012 (Sunday)</b>	<b>09:00 hrs - 12:00 hrs</b>	AR, GG and TF
			<b>14:00 hrs - 17:00 hrs</b>	AE, AG and MN
OFFLINE	Listed in Table 1	<b>February 12, 2012 (Sunday)</b>	<b>09:00 hrs - 12:00 hrs</b>	BT, CE, CH, CS, ME, PH and PI
			<b>14:00 hrs - 17:00 hrs</b>	CY, EC, EE, IN, MA, MT, XE and XL

**ONLINE Examination:** Examination using computers where the candidate will choose the correct answer out of four options or fill in the numerical answer using mouse.

**OFFLINE Examination:** Examination where the candidate will mark the correct answer out of four options in an Optical Response Sheet (ORS) by darkening the appropriate bubble.

Other important dates related to the GATE 2012 examination are listed in Table 4.

Table 4: Other important dates

Commencement of Online Application submission	Monday	12 Sept 2011
Last date for: a) Submission of Online Application Form (website closure) b) Receipt of printed version of <b>ONLINE</b> Application at respective GATE Offices	Monday Monday	17 Oct 2011 24 Oct 2011
Announcement of results	Thursday	15 March 2012

### 2.3. Examination Type

The GATE examination consists of a single paper of 3 hours duration which contains 65 questions carrying a maximum of 100 marks. The question paper will consist of only objective questions. The pattern of question papers is given in Section 4. The examination for the papers with codes AE, AG, AR, GG, MN and TF will be carried out ONLINE using computers where the candidates will be required to enter the answer for each question using mouse. For all other papers, the candidates will have to mark the correct choice on an Optical Response Sheet (ORS) by darkening the appropriate bubble against each question. There will be negative marking for each wrong answer, except for some questions, as explained in Section 4. Each GATE paper shall have a General Aptitude (GA) component carrying 15 marks.

### 2.4. GATE Results and Scorecard

#### 2.4.1. GATE Results

- GATE 2012 results will be announced on **March 15, 2012** on GATE websites of IISc and seven IITs.
- GATE 2012 score is valid for **TWO YEARS** from the date of announcement of the GATE 2012 results.
- GATE 2012 results may be made available on payment basis to interested organizations (educational institutions, R&D laboratories, industries, etc.) in India and abroad based on a Memorandum of Understanding between IIT Delhi and the requesting organization. Details in this regard can be obtained from the Chairman, GATE, IIT Delhi.

#### 2.4.2. GATE Scorecard

Details about the contents of GATE Scorecard will be made available in the GATE websites at an appropriate time.

**There is no provision for issue of additional GATE scorecard.**

The GATE 2012 Committee has the authority to decide the qualifying mark for each GATE paper. In case any claim or dispute arises in respect of GATE 2012, it is hereby made absolutely clear that the Courts and Tribunals in New Delhi and New Delhi alone shall have the exclusive jurisdiction to entertain and settle any such dispute or claim.

### 3. What is New in GATE 2012?

#### 3.1 Application Process

In GATE 2012, candidates need to register and fill the application ONLINE only by accessing the GATE websites of IISc and seven IITs. The application process is complete only when a print out of the filled ONLINE application with the candidate's signature and a good quality photo affixed in the appropriate place is received by the respective GATE office along with necessary documents, if any, on or before 24 October 2011. Please note that sale of application forms through banks and GATE office counters has been discontinued.

#### 3.2 Pre-final Year Students

Pre-final year students are not eligible to write GATE 2012. For details of eligibility, refer to section 1.2.

#### 3.3 Admit Card

Admit card can **only** be downloaded from the zonal GATE websites from 2<sup>nd</sup> January 2012. Sending Admit cards by post has been discontinued. Bring the admit card to the test center along with at least one original (not photocopied / scanned copy) and valid (not expired) photo identification. **ONLY** one of the following photo identifications is permitted: Driver's license, Passport, PAN Card, Voter ID, College ID, Employee identification card, or a notarized Affidavit with Photo, Signature, Date of Birth and Residential Address. Photocopies of the original identification document are not acceptable. **Candidates will not be permitted to take the test if original and valid photo identification is not presented.**

#### 3.4. Use of black ink ball point pen

The use of pencils to darken the bubbles in the answer sheet has been discontinued from this year. Candidates should use only black ink ball point pen for darkening of the bubbles in the answer sheet. Since bubbles darkened by the black ink ball point pen cannot be erased, candidates should darken the bubbles in the answer sheet very carefully.

#### 3.5. ONLINE Examination in Two Additional Papers

In GATE 2011, the papers with codes GG, TF, AE and MN had ONLINE examination. In GATE 2012, two additional papers, AR and AG, will also have ONLINE examination. The ONLINE examination will be conducted in two sessions on Sunday, January 29, 2012.

**Forenoon session** (09.00 hrs to 12.00 hrs): AR, GG and TF.

**Afternoon session** (14.00 hrs to 17.00 hrs): AE, AG and MN.

#### 3.5. Types of Questions in ONLINE Papers

In the ONLINE papers, the question paper will consist of questions of multiple choice type and numerical answer type. For multiple choice type questions, each question will have four choices for the answer. For numerical answer type questions, each question will have a number as the answer and choices will not be given.

### 4. Pattern of Question Papers and Marking

As mentioned in section 2.3, the examination for the papers with codes AE, AG, AR, GG, MN and TF will be carried out ONLINE using computers where the candidates will be required to enter the answer for each question using mouse. For all other papers, the candidates will have to mark the correct choice on an Optical Response Sheet (ORS) by darkening the appropriate bubble against each question.



GATE 2012 would contain questions of four different types in various papers:

- (i) Multiple choice questions carrying 1 or 2 marks each;
- (ii) Common data questions, where two successive questions use the same set of input data;
- (iii) Linked answer questions, where the answer to the first question in the pair is required to answer its successor; and
- (iv) Numerical answer questions, where the answer is a number, to be entered by the candidate.

Examples of such questions can be found in section 4.2.

In all the papers, there will be a total of 65 questions carrying 100 marks, out of which 10 questions carrying 15 marks in General Aptitude (GA) are compulsory.

In the papers bearing the codes AE, AG, BT, CE, CH, CS, EC, EE, IN, ME, MN, MT, PI, TF and XE, the Engineering Mathematics will carry 15 % of the total marks, the General Aptitude section will carry 15 % of the total marks and the remaining 70 % of the total marks is devoted to the subject of the paper.

In the papers bearing the codes AR, CY, GG, MA, PH and XL, the General Aptitude section will carry 15 % of the total marks and the remaining 85 % of the total marks is devoted to the subject of the paper.

#### 4.1. Marking

For 1 mark multiple choice questions,  $\frac{1}{3}$  mark will be deducted for a wrong answer. Likewise, for 2 marks multiple choice questions,  $\frac{2}{3}$  mark will be deducted for a wrong answer. However, for the linked answer question pair, where each question carries 2 marks,  $\frac{2}{3}$  mark will be deducted for a wrong answer to the first question only. There is no negative marking for wrong answer to the second question of the linked answer question pair. If the first question in the linked pair is wrongly answered or is unattempted, then the answer to the second question in the pair will not be evaluated. There is no negative marking for numerical answer type questions.

##### 4.1.1. General Aptitude (GA) Section

In all papers, GA questions are of multiple choice type, and carry a total of 15 marks. The GA section includes 5 questions carrying 1 mark each (sub-total 5 marks) and 5 questions carrying 2 marks each (sub-total 10 marks).

##### 4.1.2. Question papers other than GG, XE and XL

These papers would contain 25 multiple choice questions carrying one mark each (sub-total 25 marks) and 30 multiple choice questions carrying two marks each (sub-total 60 marks). Out of these, two pairs of questions would be common data questions, and two pairs of questions would be linked answer questions. In the ONLINE papers, the question paper will consist of questions of multiple choice type and numerical answer type. For multiple choice type questions, each question will have four choices for the answer. For numerical answer type questions, each question will have a number as the answer and choices will not be given.

##### 4.1.3. GG (Geology and Geophysics) Paper

Apart from the General Aptitude (GA) section, the question paper consists of two parts: Part A and Part B. Part A is common for all candidates. Part B contains two sections: Section 1 (Geology) and Section 2 (Geo-physics). Candidates will have to attempt questions in Part A and either Section 1 or Section 2 in Part B.

Part A consists of 25 multiple choice questions carrying 1-mark each (sub-total 25 marks). Each section in Part B (Section 1 and Section 2) consists of 30 multiple choice questions carrying 2 marks each (sub-total 60 marks). Out of these, two pairs of questions would be common data questions, and two pairs of questions would be linked answer questions.

#### 4.1.4. XE Paper (Engineering Sciences)

In XE paper, Engineering Mathematics section (Section A) is compulsory. This section contains 11 multiple choice questions carrying a total of 15 marks: 7 questions carrying 1-mark each (sub-total 7 marks), and 4 questions carrying 2-marks each (sub-total 8 marks).

Each of the other sections of the XE paper (Sections B through G) contains 22 questions carrying a total of 35 marks: 9 questions carrying 1 mark each (sub-total 9 marks) and 13 questions carrying 2 marks each (sub-total 26 marks). Out of the 2 mark questions, 2 pairs are common data questions and 1 pair is linked answer questions.

#### 4.1.5. XL Paper (Life Sciences)

In XL paper, Chemistry section (Section H) is compulsory. This section contains 15 multiple choice questions carrying a total of 25 marks: 5 questions carrying 1 mark each (sub-total 5 marks) and 10 questions carrying 2-marks each (sub-total 20 marks). Out of the 2-mark questions, 1 pair is common data questions, and 1 pair is linked answer questions.

Each of the other sections of the XL paper (Sections I through M) contains 20 multiple choice questions carrying a total of 30 marks: 10 questions carrying 1 mark each (sub-total 10 marks) and 10 questions carrying 2 marks each (sub-total 20 marks).

### 4.2. Types of Multiple Choice Objective Questions

Each of the multiple choice objective questions in all papers and sections will contain four answers, of which the correct answer is to be marked. The types of questions in a paper may be based on the following logic:

(i) *Recall*: These are based on facts, principles, formulae or laws of the discipline of the paper. The candidate is expected to be able to obtain the answer either from his/her memory of the subject or at most from a one-line computation.

#### Example

Q. During machining maximum heat is produced

- (A) in flank face                      (B) in rake face  
(C) in shear zone                      (D) due to friction between chip and tool

(ii) *Comprehension*: These questions will test the candidate's understanding of the basics of his/her field, by requiring him/her to draw simple conclusions from fundamental ideas.

#### Example

Q. A DC motor requires a starter in order to

- (A) develop a starting torque                      (B) compensate for auxiliary field ampere turns  
(C) limit armature current at starting                      (D) provide regenerative braking

(iii) *Application*: In these questions, the candidate is expected to apply his/her knowledge either through computation or by logical reasoning.

#### Example

Q. The sequent depth ratio of a hydraulic jump in a rectangular channel is 16.48. The Froude number at the beginning of the jump is:

- (A) 5.0                      (B) 8.0                      (C) 10.0                      (D) 12.0

(iv) *Analysis and Synthesis*: These can be linked answer questions, where the answer to the first question of the pair is required in order to answer its successor. Or these can be common data questions, in which two questions share the same data but can be solved independently of each other.

Common data based questions: Two questions are linked to a common data problem, passage and the like. Each question is independent and its solution is obtainable from the above problem data or passage directly. (Answer of the previous question is not required to solve the next question). Each question under this group will carry two marks.

### Example

**Statement for Common Data Questions, for instance, for Questions 48 and 49 in Main Paper:**

Let X and Y be jointly distributed random variables such that the conditional distribution of Y, given  $X=x$ , is uniform on the interval  $(x-1, x+1)$ . Suppose  $E(X)=1$  and  $\text{Var}(X)=5/3$ .

**First question using common data:**

Q.48 The mean of the random variable Y is

- (A)  $1/2$                       (B) 1                      (C)  $3/2$                       (D) 2

**Second question using common data:**

Q.49 The variance of the random variable Y is

- (A)  $1/2$                       (B)  $2/3$                       (C) 1                      (D) 2

Linked answer questions: These questions are of problem solving type. A problem statement is followed by two questions based on the problem statement. The two questions are designed such that the solution to the second question depends upon the answer to the first one. In other words, the first answer is an intermediate step in working out the second answer. Each question in such 'linked answer questions' will carry two marks.

### Example

**Statement for Linked Answer Questions, for instance, for Questions 52 and 53 in Main Paper:**

The open loop transfer function of a unity feedback control system is given by

$$G(s)H(s) = \frac{K}{s(s+1)(2s+1)(3s+1)}$$

**First question of the pair:**

Q.52 The value of  $K$  which will cause sustained oscillations in the closed loop system is

- (A)  $\frac{60}{121}$                       (B)  $\frac{70}{121}$                       (C)  $\frac{80}{121}$                       (D)  $\frac{90}{121}$

**Second question of the pair:**

Q.53 The frequency of sustained oscillations is

- (A)  $\frac{1}{12}$  rad/sec                      (B)  $\frac{1}{11}$  rad/sec                      (C)  $\frac{1}{\sqrt{12}}$  rad/sec                      (D)  $\frac{1}{\sqrt{11}}$  rad/sec

*The questions based on the above four logics may be a mix of single stand alone statement/phrase /data type questions, combination of option codes type questions or match items type questions.*

## **5. Other Information**

For additional information, announcements and results, visit any of the websites of the zonal GATE offices (Please see Table 2).

**ANNEXURE – I: Examination Cities and Qualifying Disciplines****A. Zone-wise List of OFFLINE Examination Cities and Corresponding Codes**

(For the following GATE papers: BT, CE, CH, CS, CY, EC, EE, IN, MA, ME, MT, PH, PI, XE and XL)

<b>Zone 1: IISc Bengaluru</b>	
Ananthapur	101
Bagalkot	102
Belgaum	103
Bengaluru	104
Davangere	105
Hassan	106
Hubli	107
Hyderabad	108
Kurnool	109
Mahabubnagar	110
Mangalore	111
Mysore	112
Secunderabad	113
Surathkal	114

<b>Zone 2: IIT Bombay</b>	
Ahmedabad	201
Ahmednagar	202
Akola	203
Amravati	204
Aurangabad	205
Bhusawal	206
Goa	207
Gondia	208
Gulbarga	209
Jalgaon	210
Kolhapur	211
Latur	212
Lonavala	213
Loni	214
Mahesana	215
Mumbai	216
Nagpur	217
Nanded	218
Nashik	219
Navi Mumbai	220
Pandharpur	221
Pune	222
Rajkot	223
Sangli	224
Satara	225
Shegaon	226
Solapur	227
Surat	228
Thane	229
Vadodara	230
Wardha	231

<b>Zone 3: IIT Delhi</b>	
Ajmer	301
Alwar	302
Bikaner	303
Delhi Central	304
Delhi East	305
Delhi North	306
Delhi South	307
Delhi West	308
Faridabad	309
Gurgaon	310
Indore	311
Jaipur	312
Jammu	313
Jodhpur	314

Sikar	315
Udaipur	316
Ujjain	317

<b>Zone 4: IIT Guwahati</b>	
Agartala	401
Asansol	402
Bhagalpur	403
Dhanbad	404
Durgapur	405
Gangtok	406
Guwahati	407
Imphal	408
Itanagar	409
Jorhat	410
Kalyani	411
Patna	412
Silchar	413
Siliguri	414
Tezpur	415

<b>Zone 5: IIT Kanpur</b>	
Agra	501
Aligarh	502
Allahabad	503
Bareilly	504
Bhopal	505
Gorakhpur	506
Gwalior	507
Jabalpur	508
Jhansi	509
Kanpur	510
Lucknow	511
Saugar (Sagar, MP)	512
Sultanpur	513
Varanasi	514

<b>Zone 6: IIT Kharagpur</b>	
Balasore	601
Berhampur (Orissa)	602
Bhimavaram	603
Bhubaneswar	604
Bilaspur	605
Cuttack	606
Eluru	607
Jamshedpur	608
Kakinada (AP)	609
Kharagpur	610
Kolkata	611
Machilipatnam	612
Raipur	613
Rajahmundry	614
Ranchi	615
Rourkela	616
Sambalpur	617
Srikakulam	618
Tadepalligudem	619
Vijayawada	620
Visakhapatnam	621

<b>Zone 7: IIT Madras</b>	
Bapatla	701
Chennai North	702
Chennai South	703

Chidambaram	704
Chittoor	705
Coimbatore	706
Dindigul	707
Ernakulam	708
Gudur	709
Guntur	710
Kadapa	711
Kannur (Kerala)	712
Karimnagar	713
Khammam	714
Kollam	715
Kothagudem	716
Kottayam	717
Kozhikode	718
Madurai	719
Manchiryal	720
Nagercoil	721
Nalgonda	722
Nellore	723
Ongole	724
Palakkad	725
Puducherry (Pondicherry)	726
Salem	727
Tenali	728
Thanjavur	729
Thiruvananthapuram	730
Thrissur	731
Tiruchirapalli	732
Tirunelveli	733
Tirupati	734
Warangal	735

<b>Zone 8: IIT Roorkee</b>	
Amritsar	801
Bathinda	802
Bijnor	803
Chandigarh	804
Dehradun	805
Ghaziabad	806
Haldwani	807
Hamirpur (HP)	808
Haridwar	809
Hisar	810
Jalandhar	811
Kota	812
Kurukshetra	813
Ludhiana	814
Mathura	815
Meerut	816
Muzaffarnagar	817
Noida	818
Patiala	819
Rohtak	820
Roorkee	821
Shimla	822
Yamunanagar	823

**B. Alphabetical Order of OFFLINE Examination Cities and Corresponding Codes**

(For the following GATE papers: BT, CE, CH, CS, CY, EC, EE, IN, MA, ME, MT, PH, PI, XE and XL)

Agartala	401	Guwahati	407	Navi Mumbai	220
Agra	501	Gwalior	507	Nellore	723
Ahmedabad	201	Haldwani	807	Noida	818
Ahmednagar	202	Hamirpur (HP)	808	Ongole	724
Ajmer	301	Haridwar	809	Palakkad	725
Akola	203	Hassan	106	Pandharpur	221
Aligarh	502	Hisar	810	Patiala	819
Allahabad	503	Hubli	107	Patna	412
Alwar	302	Hyderabad	108	Puducherry(Pondicherry)	726
Amravati	204	Imphal	408	Pune	222
Amritsar	801	Indore	311	Raipur	613
Ananthapur	101	Itanagar	409	Rajahmundry	614
Asansol	402	Jabalpur	508	Rajkot	223
Aurangabad	205	Jaipur	312	Ranchi	615
Bagalkot	102	Jalandhar	811	Rohtak	820
Balasore	601	Jalgaon	210	Roorkee	821
Bapatla	701	Jammu	313	Rourkela	616
Bareilly	504	Jamshedpur	608	Salem	727
Bathinda	802	Jhansi	509	Sambalpur	617
Belgaum	103	Jodhpur	314	Sangli	224
Bengaluru	104	Jorhat	410	Satara	225
Berhampur (Orissa)	602	Kadapa	711	Saugar (Sagar, MP)	512
Bhagalpur	403	Kakinada (AP)	609	Secunderabad	113
Bhimavaram	603	Kalyani	411	Shegaon	226
Bhopal	505	Kannur (Kerala)	712	Shimla	822
Bhubaneswar	604	Kanpur	510	Sikar	315
Bhusawal	206	Karimnagar	713	Silchar	413
Bijnor	803	Khammam	714	Siliguri	414
Bikaner	303	Kharagpur	610	Solapur	227
Bilaspur	605	Kolhapur	211	Srikakulam	618
Chandigarh	804	Kolkata	611	Sultanpur	513
Chennai North	702	Kollam	715	Surat	228
Chennai South	703	Kota	812	Surathkal	114
Chidambaram	704	Kothagudem	716	Tadepalligudem	619
Chittoor	705	Kottayam	717	Tenali	728
Coimbatore	706	Kozhikode	718	Tezpur	415
Cuttack	606	Kurnool	109	Thane	229
Davangere	105	Kurukshetra	813	Thanjavur	729
Dehradun	805	Latur	212	Thiruvananthapuram	730
Delhi Central	304	Lonavala	213	Thrissur	731
Delhi East	305	Loni	214	Tiruchirapalli	732
Delhi North	306	Lucknow	511	Tirunelveli	733
Delhi South	307	Ludhiana	814	Tirupati	734
Delhi West	308	Machilipatnam	612	Udaipur	316
Dhanbad	404	Madurai	719	Ujjain	317
Dindigul	707	Mahabubnagar	110	Vadodara	230
Durgapur	405	Mahesana	215	Varanasi	514
Eluru	607	Manchiryal	720	Vijayawada	620
Ernakulam	708	Mangalore	111	Visakhapatnam	621
Faridabad	309	Mathura	815	Warangal	735
Gangtok	406	Meerut	816	Wardha	231
Ghaziabad	806	Mumbai	216	Yamunanagar	823
Goa	207	Muzaffarnagar	817		
Gondia	208	Mysore	112		
Gorakhpur	506	Nagercoil	721		
Gudur	709	Nagpur	217		
Gulbarga	209	Nalgonda	722		
Guntur	710	Nanded	218		
Gurgaon	310	Nashik	219		

**Note:** The first digit of the number code of an examination city indicates the corresponding zone. For example, the number code for Agartala is 401. The zone for Agartala is Zone 4. Refer to Table 1 for contact details of zonal GATE offices.

**C. ONLINE Examination Cities****(For the following GATE papers: AE, AG, AR, GG, MN and TF)**

115	Bengaluru	IISc Bengaluru
116	Hyderabad	
117	Mangalore	
232	Ahmedabad	IIT Bombay
233	Mumbai	
234	Pune	
318	Delhi	IIT Delhi
319	Gurgaon	
320	Jaipur	
416	Durgapur	IIT Guwahati
417	Guwahati	
418	Patna	
515	Allahabad	IIT Kanpur
516	Kanpur	
517	Lucknow	
622	Kolkata	IIT Kharagpur
623	Vijayawada	
624	Visakhapatnam	
736	Chennai	IIT Madras
737	Coimbatore	
738	Ernakulam	
824	Chandigarh	IIT Roorkee
825	Noida	
826	Roorkee	

## D. Qualifying Disciplines

<b>Discipline: Engineering/Technology</b>
Aeronautical Engg.
Aerospace Engg.
Agricultural Engg.
Applied Mechanics
Architecture
Automobile Engg.
Biochemical Engg.
Biomedical Engg.
Biotechnology
Ceramic & Glass Technology
Chemical Engg.
Chemical Technology
Civil/Civil & Environmental/Structural Engg./Construction Engg.
Computer Engg./Computer Science & Engg./Technology
Control and Instrumentation
Electrical Engg./ Electrical and Electronics Engg./Power Engineering
Electro-Chemical Engg.
Electronics & Comm./Electronics Engg./Comm. Engg./Telecommunication Engg.
Energy Engg.
Environmental Engg.
Food Technology/Food Processing Engg.
Industrial Engg.
Industrial Management
Information Science/Information Technology
Instrumentation/ Electronics/Control
Instrumentation & Process Control
Manufacturing Engg.
Material Science and Engineering
Mechanical Engg.
Mechatronics
Medical Instrumentation
Metallurgical Engg/ Industrial Metallurgy
Mineral Engg./Mineral Dressing
Mining Engg./Technology, Mining & Machinery
Naval Architecture/Marine Engg.
Oil Technology
Paint Technology
Petro-Chemical Engg.
Petroleum Engg./Technology

<b>Discipline: Engineering/Technology</b>
Planning
Plastic Technology
Polymer Technology/Science
Production & Industrial Engg.
Production Engg./Production & Management
Renewable Energy
Rubber Technology
Textile Engineering & Fibre Science
All other disciplines in Engg./Technology

<b>Discipline: Sciences</b>
Agricultural Science
Applied Electronics
Applied Physics
Biochemistry
Bio-Sciences
Chemistry
Computer Applications
Earth Sciences
Electronics
Engineering Physics
Geology/ Geophysics
Industrial Chemistry
Life Science/Veterinary/Animal Science
Life Sciences
Life Sciences (Botany)
Life Sciences (Zoology)
Materials Science
Mathematics/Applied Mathematics
Microbiology
Nano Science & Technology
Nuclear Physics
Operations Research
Pharmaceutical Sciences/Pharmacy
Physics
Radio Physics
Radio Physics & Electronics
Statistics
Textile Chemistry
All other disciplines in Sciences