



# INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH

(An Advanced Research Institute Established by Reserve Bank of India)

Deemed University

Reaccredited with 'A' Grade by NAAC

General A.K. Vaidya Marg, Santosh Nagar, Goregaon (East), Mumbai - 400 065

## Online Examination for Admission to M. Sc. Programme - 2013

DATE OF EXAM - 28.04.2013

### INFORMATION HANDOUT

This year the Admission Test will be conducted ONLINE.

This handout contains details pertaining to various aspects of the online exam you are going to undertake and important instructions about related matters. You are advised to study the handout carefully as it will help you in preparing for the examination.

Before appearing for the online examination you should strictly ensure yourself that you fulfil the eligibility criteria in all respects. **IGIDR** will reject, at any stage, any candidate who does not satisfy the eligibility criteria.

**Please note that you will have to pass in each of the tests. However, since this is a competitive examination, mere passing is not adequate. You have to obtain a high rank in the order of merit. You should, therefore, put in your best efforts in the examination.**

The Online examination will comprise THREE multiple choice objective tests.

The Third Test will have TWO options and you should answer any ONE of them. You can choose the option you wish to answer irrespective of your academic background.

Sr. No.	Test	Questions	Time
I.	Comprehension, Reasoning and Analytical Ability	1-40	Composite Time of 180 Minutes
II.	Basic Mathematics	41-80	
IIIA.	Economics	81-110	
<b><u>OR</u></b>	<b><u>OR</u></b>		
IIIB.	Advanced Mathematics (Bachelors Ancillary Level)	111-140	

Note: If you are found to have answered questions from both Tests IIIA and IIIB, then only the Test with the higher number of answered questions will be graded. If equal number of questions are answered from both IIIA and IIIB, then only the first Test i.e. IIIA will be graded.

The time for the test is 180 minutes; however you may have to be at the venue for approximately 4 hours including the time required for logging in, collection of the call letters, giving of instructions etc. The tests will be provided in English. You can attempt any question at any point of time within these 180 minutes.

All the questions will have multiple choices. Out of the five answers to a question only one will be the correct answer. **You have to select the most appropriate answer and 'mouse click' that alternative which you feel is appropriate/correct. The alternative/option that you have clicked on will be treated as your answer to that question.**

There will be penalty for wrong answers marked by you. For every wrong answer marked, 1/4th of the marks assigned to that question will be deducted as penalty.

You have to qualify in each of the tests separately. The qualifying criteria will be decided by the institute.

### Details of the On-line Examination Pattern

- (1) The examination would be conducted on-line i.e. on a computer.
- (2) The questions will be in English.
- (3) All the questions will have multiple choices. Out of the five answers to a question only one will be the correct answer. **The candidate has to select the most appropriate answer and ‘mouse click’ that alternative which he/ she feels is appropriate/ correct. The alternative/ option that is clicked on will be highlighted and will be treated as the answer to that question.**
- (4) The clock has been set at the server and the countdown timer at the top right corner of your screen will display the time remaining for you to complete the exam. When the clock runs out the exam ends by default - you are not required to end or submit your exam.
- (5) The question palette at the right of screen shows one of the following statuses of each of the questions numbered:



You have not visited the question yet.



You have not answered the question. To save your answer, you MUST click on **Save & Next**.



You have answered the question.



You have NOT answered the question but have marked the question for review.



You have answered the question but marked it for review.

The Marked for Review status simply acts as a reminder that you have set to look at the question again. *If an answer is selected for a question that is Marked for Review, the answer will be considered in the final evaluation.*

- (6) To select a question to answer, you can do one of the following:
  - (a) Click on the question number on the question palette at the right of your screen to go to that numbered question directly. Note that using this option does NOT save your answer to the current question.
  - (b) Click on Save and Next to save answer to current question and to go to the next question in sequence.
  - (c) Click on Mark for Review and Next to save answer to current question, mark it for review, and to go to the next question in sequence.
- (7) You can view the entire paper by clicking on the **Question Paper** button.
- (8) To select your answer, click on one of the option buttons
- (9) To change your answer, click the another desired option button
- (10) To save your answer, you MUST click on **Save & Next**
- (11) To deselect a chosen answer, click on the chosen option again or click on the **Clear Response** button.
- (12) To mark a question for review click on **Mark for Review & Next**. *If an answer is selected for a question that is Marked for Review, the answer will be considered in the final evaluation.*
- (13) To change an answer to a question, first select the question and then click on the new answer option followed by a click on the **Save & Next** button.
- (14) Questions that are saved or marked for review after answering will ONLY be considered for evaluation.
- (15) Sections will be displayed on the top bar of the screen. Questions in a section can be viewed by clicking on the section name. The section you will view will be highlighted.

- (16) After clicking the **Save & Next** button on the last question for a section, you will automatically be taken to the first question of the next section.
- (17) You can move the mouse cursor over the section names to view the status of the questions for that section.
- (18) You can shuffle between sections and questions anytime during the examination as per your convenience.
- (19) The candidates are requested to follow the instructions of the “Test Administrator” carefully. If any candidate does not follow the instructions / rules, it would be treated as a case of misconduct/ adoption of unfair means and such a candidate would be liable for debarment from appearing for examinations for a period as decided by the Organization.
- (20) The candidates may ask the Test Administrator about their doubts or questions only before the commencement of the test. No query shall be entertained after the commencement of the examination.
- (21) After the expiry of 180 minutes, the candidates will not be able to attempt any question or check their answers. The answers of the candidate would be saved automatically by the computer system even if he/ she has not clicked the “Submit” button.
- (22) **Please note :**
  - (a) **Candidates will not be allowed to “finally submit” before the completion of total time of the examination.**
  - (b) **Under no circumstances should a candidate click on any of the ‘keyboard keys’ once the exam starts as this will lock the exam.**

**B] General Instructions:**

- (1) Please note your Roll No., password, date, time and venue address of the examination given in the call letter.
- (2) You may visit the venue one day before the Online Examination to confirm the location so that you are able to report on time on the day of the examination.
- (3) The call letter should be brought with you to the examination venue along with your recent passport size photograph duly pasted on it.
- (4) You must scrupulously follow the instructions of the Test Administrator and Organization Representative at the examination venue. If you violate the instructions you will be disqualified and will be asked to leave the examination venue.
- (5) No use of calculators (separate or with watch), books, note books or written notes, cell phones (with or without camera facility), or any other electronic device will be allowed during the examination.
- (6) Your responses (answers) will be analysed with other candidates to detect patterns of similarity of right and wrong answers. If in the analytical procedure adopted in this regard, it is inferred/concluded that the responses have been shared and scores obtained are not genuine/valid, your candidature may be cancelled and/or the result withheld. Any candidate who is found copying or receiving or giving assistance or engaging in any behaviour unbecoming of a candidate will not be considered for assessment. The organization may take further action against such candidates as deemed fit by it.
- (7) You should bring with you a ball-point pen. A sheet of paper will be provided which can be used for rough work or taking down the question number you would like to review at the end of the test before submitting your answers. After the test is over you should hand over this sheet of paper to the Test Administrator before leaving the venue.

**IMPORTANT POINTS TO REMEMBER**

You are advised to bring with you the following:

- (i) Call letter and the photo ID card.
- (ii) One Ball point pen

**WISH YOU GOOD LUCK**

## SAMPLE QUESTIONS

Please note that the types of questions in this handout are only illustrative and not exhaustive. In the actual examination you will find questions of a higher difficulty level on some or all of these types and also questions on the types not mentioned here. Some sample questions are given below.

### TEST I

#### TEST OF COMPREHENSION, REASONING AND ANALYTICAL ABILITY

This test is designed to examine the candidate's verbal ability, analytical reasoning and quantitative skills.

- I. Of the 197 million square miles making up the surface of the globe, 71 percent is covered by the interconnecting bodies of marine water; the Pacific Ocean alone covers half the Earth and averages nearly 14,000 feet in depth. The *continents* - Eurasia, Africa, North America, South America, Australia and Antarctica - are the portions of the *continental masses* rising above sea level. The submerged borders of the continental masses are the *continental shelves*, beyond which lie the deep-sea basins.

The oceans attain their greatest depths not in their central parts, but in certain elongated furrows, or long narrow troughs, called *deeps*. The profound troughs have a peripheral arrangement, notably around the borders of the Pacific and Indian oceans. The position of the deeps near the continental masses suggest that the deeps, like the highest mountains, are of recent origin, since otherwise they would have been filled with waste from the lands. This suggestion is strengthened by the fact that the deeps are frequently the sites of the world-shaking earthquakes. For example, the "tidal wave" that in April, 1946, caused widespread destruction along Pacific coasts resulted from a strong earthquake on the floor of the Aleutian Deep.

1. Which of the following would be the most appropriate title for the passage?  
(1) Features of the Earth's Surface      (2) Marine Topography      (3) The Causes of Earthquakes  
(4) Primary Geologic Considerations      (5) How to prevent Erosion.

**Ans.: (1)**

2. According to the passage, the peripheral furrows or *deeps* are found —  
(1) only in the Pacific and Indian oceans      (2) near earthquakes  
(3) near the shore      (4) in the centre of the ocean  
(5) to be 14,000 feet in depth in the Pacific.

**Ans.: (3)**

3. From this passage, it can be inferred that earthquakes —  
(1) occur only in the peripheral furrows  
(2) occur more frequently in newly formed land or sea formations.  
(3) are a prime cause of soil erosion  
(4) will ultimately "make mountains level"  
(5) are caused by the weight of the water

**Ans.: (2)**

- II. Fill in the blanks with the pair of words that best fits the meaning of the sentence.

Though he claimed the business was ....., his irritability .....that claim.  
(1) sound ....belied      (2) expanding .... supported      (3) downsizing .... vindicated  
(4) static .... contradicted      (5) booming .... affirmed

**Ans.: (1)**

- III. Select the pair that best expresses the relationship similar to the one in the original pair.

MODERATOR : DEBATE ::

- (1) legislator : election      (2) chef : banquet      (3) auditor : lecture  
(4) conspirator : plot      (5) umpire : game

**Ans.: (5)**

- IV. The letters A, B, C, D, E, F and G, not necessarily in that order, stand for seven consecutive integers from 1 to 10.  
 D is 3 less than A.  
 B is the middle term.  
 F is as much less than B as C is greater than D.  
 G is greater than F.

1. The fifth integer is—  
 (1) A (2) C (3) D (4) E (5) F

**Ans.: (2)**

2. A is as much greater than F as which integer is less than G?  
 (1) A (2) B (3) C (4) D (5) E

**Ans.: (4)**

3. If  $A = 7$ , the sum of E and G is —  
 (1) 8 (2) 10 (3) 12 (4) 14 (5) 16

**Ans.: (2)**

- V. If Elaine is on the steering committee, then she is on the central committee. This statement can be logically deduced from which of the following statements?

- (1) All members of the central committee are on the steering committee.  
 (2) Elaine is on either the central committee or the steering committee.  
 (3) Everyone who is on the steering committee is also on the central committee.  
 (4) Some members of the central committee are on the steering committee.  
 (5) Elaine is on the steering committee.

**Ans.: (3)**

- VI. (1) A causes B or C, but not both, (2) F occurs only if B occurs,  
 (3) D occurs if B or C occurs, (4) E occurs only if C occurs,  
 (5) J occurs only if E or F occurs, (6) D causes G or H or both,  
 (7) H occurs if E occurs, (8) G occurs if F occurs.

1. If A occurs, which may occur?  
 I. F and G II. E and H III. D  
 (1) I only (2) II only (3) III only (4) I & II or II & III, but not both (5) I, II, and III

**Ans.: (4)**

2. If J occurs, which must have occurred ?  
 (1) E (2) Both E and F (3) Either B or C (4) G (5) Both B and C

**Ans.: (3)**

## Test II

### TEST OF BASIC MATHEMATICS

This test is designed to examine the candidate's mathematical abilities. The sample questions given below are suggestive.

- Q.1. For each set A,  
 (1)  $\{A\} \subset 2^A$  (2)  $\{A\} \not\subset 2^A$  (3)  $A \notin 2^A$  (4)  $A \subset 2^A$  (5) None of these

**Ans.: (1)**

- Q.2.  $\int xe^x dx$  is  
 (1)  $\frac{x^2}{2}e^x + xe^x$  (2)  $e^x(x+1)$  (3)  $e^x(x-1)$  (4)  $\log x(x-1)$  (5) None of these

**Ans.: (3)**

- Q.3.**  $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$  is  
 (1) Not defined (2) 1 (3) -1 (4) 0 (5) None of these

**Ans.: (2)**

- Q.4.** Given  $f(x) = 2x^3 - 3x^2 - 36x - 10$ , the function attains  
 (1) minimum at  $x = 4$  (2) maximum at  $x = 3$  (3) minimum at  $x = -2$   
 (4) maximum at  $x = 6$  (5) None of these

**Ans.: (5)**

- Q.5.** The values of K for which the system of equations  
 $x + y = 4$   
 $Kx + 2y + 3z = 1$   
 $2x + y + Kz = 5$   
 does not have any solution, are  
 (1) 1, 3 (2) -3, -1 (3) 3, -1 (4) 1, -3 (5) None of these

**Ans.: (3)**

- Q.6.** The mean wage and s.d. of 150 men were Rs.60 and Rs.4 per week respectively and that of another 200 men were Rs. 90 and Rs.3 per week. The s.d. of the work force of 350 men considered as one group is  
 (1) 9 (2)  $\frac{32}{7}$  (3) 15.5 (4) 21.1 (5) None of these

**Ans.: (3)**

### Test IIIA

#### TEST OF ECONOMICS

This test is designed to examine the candidate's abilities in basic micro and macro economics. The sample questions given below are suggestive.

- Q1.** The Indifference relation (which captures the notion of indifference curve) is:  
 (1) Asymmetric (2) Symmetric (3) Both (1) and (2)  
 (4) Negatively transitive (5) None of the above

**Ans.: (2)**

- Q2.** If A's utility function is  $U_A(x, y) = (x^3)(y^2)$  and B's utility function is  $U_B(x, y) = (x^{1/2})(y^{1/3})$ , then A will always derive more happiness than B does from any combination of commodities x and y.  
 (1) True (2) Partially True (3) False (4) Partially False (5) None of the above

**Ans.: (3)**

- Q3.** Calculate the cross price elasticity of demand for wheat. The wheat demand function is  $q = 1200 - 9.5p + 16.2p_r + 0.2y$  where q is the quantity of wheat demanded in thousands of metric tons per year, p is the price of wheat in Rupees per kg,  $p_r$  is the price of rice in Rupees per kg, and y is the income of the consumers. Assume that p is initially 45 Rupees per kg,  $p_r$  is 31 Rupees per kg, and q is 1275 thousand metric tons per year.  
 (1) -0.34 (2) 0.39 (3) 9.5 (4) 16.2 (5) None of the above

**Ans.: (2)**

- Q4.** Which of the following would shift the demand curve for new textbooks to the right?  
 (1) A fall in the price of paper used in publishing texts.  
 (2) A fall in the price of equivalent used textbooks  
 (3) An increase in the number of students attending college  
 (4) A fall in the price of textbooks  
 (5) None of the above.

**Ans.: (3)**

- Q5. Which of the following statement(s) is/are **false** with respect to the multiplier for investment and govt. purchases?
- With lump sum taxes the balanced budget multiplier is one.
  - If tax revenue is made a function of income then the multiplier for govt. purchases  $g$  falls as compared to the case where tax are assumed to be lump sum.
  - If tax revenue is made a function of income then the multiplier for planned investment rises as compared to the case where tax are assumed to be lump sum.
- (1) a ,b and c      (2) a and b      (3) a and c      (4) a      (5) c

**Ans.: (5)**

- Q6. The LM curve is the set of combinations of \_\_\_\_\_ such that \_\_\_\_\_.
- interest rates and real money balances, real income equals real money balances times  $(1/r)$ , where  $r$  is the rate of interest.
  - interest rates and real money balances, the money supply is equal to money demand
  - real income and real money balances, the production of output is equal to output demanded
  - real income and interest rates, the production of output is equal to output demanded
  - real income and interest rates, the money supply is equal to money demanded

**Ans.: (5)**

**OR**

**Test IIIB**

**Test of Advanced Mathematics**

This test is designed to examine the candidate's abilities in advanced level mathematics. The sample questions given below are suggestive.

- Q1. A ray of light coming from the point  $(1,2)$  is reflected at a point 'A' on the x axis and then passes through the point  $(5,3)$ . The coordinates of the point 'A' are
- (1)  $\left(\frac{13}{5}, 0\right)$       (2)  $\left(\frac{5}{13}, 0\right)$       (3)  $\left(\frac{3}{5}, 0\right)$       (4)  $(-7, 0)$       (5) None of the above

**Ans.: (1)**

- Q2. If  $x = \sin\left(\frac{2\pi}{7}\right) + \sin\left(\frac{4\pi}{7}\right) + \sin\left(\frac{8\pi}{7}\right)$  and  $y = \cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{8\pi}{7}\right)$  then  $x^2 + y^2$  is
- (1) 2      (2) 3      (3) 4      (4) 1      (5) None of the above

**Ans.: (1)**

- Q3. Evaluate  $\int e^x \frac{1 + \sin x}{1 + \cos x} dx$
- (1)  $e^x \sec^2 \frac{x}{2} + c$       (2)  $e^x \tan^2 \frac{x}{2} + c$       (3)  $e^x \tan x + c$       (4)  $e^x \tan \frac{x}{2} + c$       (5) None of the above

**Ans.: (4)**

- Q4. The particular solution of the equation  $\frac{d^2y}{dx^2} + \frac{dy}{dx} + 2y = e^x$  is
- (1)  $e^x$       (2)  $\frac{1}{4} e^x$       (3)  $e^{4x}$       (4)  $e^{\frac{x}{4}}$       (5) None of the above

**Ans.: (2)**

Q5. Laplace Transform of  $\cos at$  is

(1)  $s^2 + a^2$

(2)  $\frac{a}{s^2 + a^2}$

(3)  $\frac{s}{s^2 + a^2}$

(4)  $\frac{1}{s + a}$

(5) None of the above

**Ans.: (3)**

Q6. Evaluate  $\iint xy \, dx \, dy$  taken over the positive quadrant of the circle  $x^2 + y^2 = a^2$

(1)  $a^2$

(2)  $\frac{a^4}{2}$

(3)  $\frac{a^2}{8}$

(4)  $\frac{a^4}{8}$

(5) None of the above

**Ans.: (4)**



# GOKHALE INSTITUTE OF POLITICS AND ECONOMICS

(Deemed to be University u/s 3 of the UGC Act, 1956)

## Model Questions for Entrance Examination for Masters Programme

### Section A

1. On the eve of the departure of the British, on 14 August 1947, Jawaharlal Nehru declared: 'Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge'. 'The achievement we celebrate today', Nehru went on, 'is but a step, an opening of opportunity, to the great triumphs and achievements that await us.' He reminded the country that the task ahead included 'the ending of poverty and ignorance and disease and inequality of opportunity.'

(Dreze and Sen, *India: Economic Development and Social Opportunity*, 1995:1)

Read the passage above carefully and choose the correct answers to the following questions:

- i. What achievement was being celebrated by Nehru and others?
    - a) eradication of poverty in India
    - b) social equality of opportunity
    - c) independence from the British rule
    - d) fulfillment of long-standing pledge
  - ii. What were the triumphs and achievements that awaited us on the day of independence?
    - a) nuclear bomb
    - b) total literacy and social equality
    - c) victory in war with neighbouring nations
    - d) having Indians amongst the top richest corporate houses of the world
2. Hot : Scalding as
    - a) Cold: Freezing
    - b) Cold: Lukewarm
    - c) Cold: Warm
    - d) None of the above

3. 4:16 as 16:

- a) 256
- b) 32
- c) 48
- d) 16
- e) None of the above

4. Complete the sequence a, c, f, j ,

- a) o
- b) n
- c) p
- d) D

5. What is the next number in the sequence 8 13 5 15 20 12 ?

- a) 17
- b) 15
- c) 36
- d) None of the above

## Section B

1. Where a tax can be shifted the incidence depends on
  - a) how many producers there are
  - b) who is legally obliged to pay the tax
  - c) elasticities of demand and supply
  - d) whether there is perfect or imperfect information
  
2. The models used for planning in India are based on the idea of
  - a) Mahatma Gandhi
  - b) Manavendra Nath Roy
  - c) J. R. D. Tata
  - d) P. C. Mahalanobis
  
3. L-Shaped indifference curves arise when
  - a) Commodities are unrelated to one another
  - b) Commodities are perfect substitutes of one another
  - c) When one commodity is a necessity and the other a luxury
  - d) Commodities are perfect complements of one another
  
4. The production function  $Q = AL^\alpha K^\beta$  obeys constant returns to scale if
  - a)  $\alpha + \beta = 1$
  - b)  $\alpha + \beta = 0$
  - c)  $\alpha + \beta = -1$
  - d) none of the above
  
5. You are an analyst for a metropolitan transportation authority. You are asked if it would improve efficiency to buy more buses, and if so, how many more should be bought. The operating cost of a bus is 30 during the day and 60 during the night, when higher wages must be paid to drivers and other workers. The daily capital cost of a bus, whether or not it is used, is 10. The demand for buses aggregated over persons and stops during the 12 hours of day and night, respectively D and N, are

$$Q_D = 160 - P_D$$

$$Q_N = 80 - P_N$$

What prices should be charged to induce efficient ridership?

a)  $P_D = 45$ ,  $P_N = 55$

b)  $P_D = 40$ ,  $P_N = 60$

c)  $P_D = 70$ ,  $P_N = 80$

d)  $P_D = 60$ ,  $P_N = 40$

## Section C

- Two trains start from P and Q and travel towards one another at speeds of 50 kmph and 40 kmph respectively. By the time they meet, the first train travelled 100 km more than the second train. What is the distance between P and Q?
  - 500 km
  - 630 km
  - 660 km
  - 900 km
- What is the derivative of  $6x^3$  with respect to  $x$ ?
  - 0
  - $12x$
  - $18x^2$
  - $18x$
  - $18x^3$
- What is the value of  $e^0$ ?
  - 0
  - 1
  - $e$
  - 2
  - None of the above
- If random variable  $X$  has probability density function given by
$$f(x) = e^{-x} \quad x$$
$$= 0 \quad \text{Otherwise}$$
Find  $P[2x + 3 = 5]$ 
  - $1/2$
  - $1/4$
  - 0
  - 1

5. What is the rank of the matrix:

$$\begin{bmatrix} 1 & 2 & 1 & 2 \\ 4 & 4 & 0 & 0 \\ 3 & 6 & 0 & 0 \\ 2 & 4 & 2 & 4 \end{bmatrix}$$

- a) 0
- b) 3
- c) 1
- d) 2

6. What is the fourth term of  $(2a - 6b)^8$ ?

- a)  $28 \cdot 16 \cdot 1296$
- b)  $28 \cdot 32 \cdot 216$
- c)  $70 \cdot 32 \cdot 216$
- d)  $56 \cdot 32 \cdot 216$

7. What is the sum of the below series?

$$\sum_{n=1}^{\infty} \left( \frac{1}{2^n} + \frac{1}{3^n} \right)$$

**and**

$$\sum_{n=1}^{\infty} \left( 7 \frac{1}{3^n} - 4 \frac{1}{2^n} \right)$$

- a)  $3/2$  and  $-1/2$
- b)  $2/3$  and  $5/2$
- c)  $2/3$  and  $1/2$
- d)  $3/2$  and  $5$

8. What is the value of  $\log_4 16$ ?

- a) 4
- b) 2
- c) 8
- d) 1

9. On which of the following interval(s) must the function  $f(x) = 2+x^2 -x^3$  have a root?

- a)  $[-1, 0]$
- b)  $[0, 1]$
- c)  $[1, 2]$
- d)  $[2, 3]$

10. Find the number of ways in which two books on economics and three books on accountancy can be arranged in a line.

- a) 60
- b) 120
- c) 24
- d) 40

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**GOKHALE INSTITUTE OF POLITICS AND ECONOMICS**

**Model Questions for Entrance Examination for  
Masters Programme**

Solution Key to Mathematics, Statistics & Economics Questions

**Section-B**

1. (c) Incidence of tax refers to whom will final bearer of tax.  
So, it depends on elasticities of demand & supply.
2. (d) The model are based on the idea of P.C. Mahalanobis.
3. (d) L-Shaped indifference curves arises when Commodities are perfect complements of one another.
4. (a) Here Production function is homogeneous function with Constant returns to scale, so  $\alpha + \beta = 1$ .
5. Very Easy. Try Yourself.

**Section-C**

1. Very Easy. Do Yourself.
2. (c)  $\frac{d}{dx}(6x^3) = 18x^2$ .
3. (b)  $e^0 = e^{m-m} = \frac{e^m}{e^m} = 1$ .
4. (b)  $P[2x+3=5]=P[X=1]=e^{-1} = 0.35 \approx \frac{1}{4}$ .
5. (b) Perform these elementary row operations, then you will get the answer.  $R'_4 = \frac{R_4}{2}$ , then  $R'_4 = R_4 - R_1$ .



6. (a)  $t_4 = \binom{8}{3} 2^3 (-6)^5 = 28 * 16 * 1296$

7. (a) Let us calculate  $\sum_{n=1}^{\infty} \frac{1}{2^n}$  &  $\sum_{n=1}^{\infty} \frac{1}{3^n}$ .

Both are infinite geometric series.

So,  $\sum_{n=1}^{\infty} \frac{1}{2^n} = \frac{1/2}{1-1/2} = 1$ .

And  $\sum_{n=1}^{\infty} \frac{1}{3^n} = \frac{1/3}{1-1/3} = \frac{1}{2}$ .

So,  $\sum_{n=1}^{\infty} (\frac{1}{2^n} + \frac{1}{3^n}) = \frac{3}{2}$ ,

And  $\sum_{n=1}^{\infty} (7 \frac{1}{3^n} - 4 \frac{1}{2^n}) = -\frac{1}{2}$ .

8. (b)  $\log_4 16 = 2 \log_4 4 = 2$ .

9. (d)  $f(-1) = 4$ ,  $f(0) = 2$ ,  $f(1) = 2$ ,  $f(2) = 0$ ,  $f(3) = -16$ , so there is a sign change between 2 and 3. So,  $f(x)$  have a root in  $[2,3]$ .

10. (b) 5 Books can be arranged in  $5!$  Ways.

**ENTRANCE EXAMINATION (2013-14)**

**CUTN – MSE**

**15 – 16, June 2013**

The Entrance Examination will have 100 questions to be completed in 120 minutes. There are two parts – Part A and Part B.

**PART A (35 questions)**

This part contains multiple choice questions on language, analytical skills and general aptitude.

**PART B (65 questions)**

Part B contains four sections covering simple mathematics, statistics, advanced mathematics and economics. While the first three sections contain 15 questions each, the last section on economics will contain 20 questions. All questions carry equal marks and there are no negative markings.

The syllabus for the four sections is as follows:

**Mathematics** – Plus 2 level Mathematics covering functions, linear Algebra, Limits, differential and integral calculus.

**Statistics** – Basic statistics of Plus 2 level covering measures of central tendency, probability distribution – normal etc.

**Advanced Mathematics** – Graduate level mathematics covering linear algebra, limits and derivatives, optimization, integration etc.

**Economics** – Graduate level economics covering topics in micro- and macro-economics and Indian economic development.

**Mathematics – Sample Questions**

1.	Find the third order derivative of $Y = 5X^3$ : <input type="checkbox"/> (a) 30 <input type="checkbox"/> (b) $15X^2$ <input type="checkbox"/> (c) $30X$ <input type="checkbox"/> (d) $5X^2$
2.	$A = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -2 \\ -1 & 0 \\ 2 & 1 \end{bmatrix}$ Find AB <input type="checkbox"/> (a) $\begin{bmatrix} 0 & 0 \\ 5 & 1 \\ 7 & 0 \end{bmatrix}$ <input type="checkbox"/> (b) $\begin{bmatrix} 1 & -2 \\ 3 & -5 \\ 4 & 9 \end{bmatrix}$ <input type="checkbox"/> (c) $\begin{bmatrix} 3 & -2 \\ 6 & -5 \\ 5 & -7 \end{bmatrix}$ <input type="checkbox"/> (d) $\begin{bmatrix} 2 & -2 \\ 5 & 3 \\ 7 & 4 \end{bmatrix}$
3.	$\lim_{x \rightarrow 5} (3x^3 + 5x^2 - 2x + 3)$ equals: <input type="checkbox"/> (a) 439 <input type="checkbox"/> (b) 493 <input type="checkbox"/> (c) 394 <input type="checkbox"/> (d) 934
4.	If $A = \begin{pmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{pmatrix}$ then $A^{-1}A$ is <input type="checkbox"/> (a) 0 <input type="checkbox"/> (b) A <input type="checkbox"/> (c) I <input type="checkbox"/> (d) $A^2$
5.	The point in the interval (3, 5] is <input type="checkbox"/> (a) 3 <input type="checkbox"/> (b) 5.3 <input type="checkbox"/> (c) 0 <input type="checkbox"/> (d) 4.35

### Statistics – Sample Questions

6.	Probability of sure event is <input type="checkbox"/> (a) 1 <input type="checkbox"/> (b) 0 <input type="checkbox"/> (c) -1 <input type="checkbox"/> (d) S
7.	A single letter is selected at random from the word PROBABILITY The probability that it is not a vowel is <input type="checkbox"/> (a) 3/11 <input type="checkbox"/> (b) 2/11 <input type="checkbox"/> (c) 4/11 <input type="checkbox"/> (d) 0
8.	If A and B are independent event, then $P(A \cap B)$ is <input type="checkbox"/> (a) $P(A) P(B)$ <input type="checkbox"/> (b) $P(A) + P(B)$ <input type="checkbox"/> (c) $P(A/B)$ <input type="checkbox"/> (d) $P(B) - P(A)$
9.	Which expression gives the probability $P\left(\frac{1}{2} < X < 1\right)$ using $F(x)$ , given $0 < x < 1$ <input type="checkbox"/> (a) $P\left(\frac{1}{2} < X < 1\right) = F\left(\frac{1}{2}\right) - F(1)$ <input type="checkbox"/> (b) $P\left(\frac{1}{2} < X < 1\right) = F(1) - F\left(\frac{1}{2}\right)$ <input type="checkbox"/> (c) $P\left(\frac{1}{2} < X < 1\right) = F(1) + F\left(\frac{1}{2}\right)$ <input type="checkbox"/> (d) $P\left(\frac{1}{2} < X < 1\right) = F(1) - F(0)$
10.	If a constant value 4 is subtracted from each observation of a set, the value of the variance is <input type="checkbox"/> (a) reduced by 4 <input type="checkbox"/> (b) reduced by 16 <input type="checkbox"/> (c) reduced by 2 <input type="checkbox"/> (d) unaltered

### Advanced Mathematics – Sample Questions

11.	Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 0 & -1 \\ 3 & 4 & 5 \end{bmatrix}$ . Which of the following is true? <input type="checkbox"/> (a) A is invertible since $\det(A) = 0$ <input type="checkbox"/> (b) A is not invertible since $\det(A) = 0$ <input type="checkbox"/> (c) A is invertible since $\det(A) \neq 0$ <input type="checkbox"/> (d) A is not invertible since $\det(A) \neq 0$
12.	Which of the following polynomials leaves a remainder when divided by $x+2$ ? <input type="checkbox"/> (a) $r(x) = (x+2)^{12}$ <input type="checkbox"/> (d) $p(x) = x^2 - 4$ <input type="checkbox"/> (c) $s(x) = x^4 + 3x^2 + 1$ <input type="checkbox"/> (d) $q(x) = -x^3 + 8x^2 + 3x - 34$
13.	The characteristic roots of the matrix $A = \begin{pmatrix} 6 & 6 \\ 6 & -3 \end{pmatrix}$ are: <input type="checkbox"/> (a) Both positive <input type="checkbox"/> (b) Both negative <input type="checkbox"/> (c) One positive and one negative <input type="checkbox"/> (d) None of the above
14.	The value of $\lim_{x \rightarrow \infty} \left( \sqrt{x^2 + 1} - \sqrt{x^2 - 1} \right)$ is <input type="checkbox"/> (a) -1 <input type="checkbox"/> (b) 1 <input type="checkbox"/> (c) 0 <input type="checkbox"/> (d) none of these
15.	At compound interest if a certain sum of money doubles in n years then the amount will be four fold in <input type="checkbox"/> (a) $2n^2$ years <input type="checkbox"/> (b) $n^2$ years <input type="checkbox"/> (c) 4n years <input type="checkbox"/> (d) 2n years

### Economics – Sample Questions

16.	<p>The classical <i>Quantity Theory of Money</i> assumes that:</p> <p><input type="checkbox"/> (a) income is constant.                      <input type="checkbox"/> (b) velocity is constant.</p> <p><input type="checkbox"/> (c) prices are constant.                      <input type="checkbox"/> (d) the money supply is constant.</p>
17.	<p>Assume that apples cost Rs.0.50 in 2002 and Re.1 in 2007, whereas oranges cost Re.1 in 2002 and Rs.0.50 in 2007. If 10 apples and 5 oranges were purchased in 2002, and 5 apples and 10 oranges were purchased in 2007, the CPI for 2007, using 2002 as the base year, is:</p> <p><input type="checkbox"/> (a) 0.75.                      <input type="checkbox"/> (b) 0.80                      <input type="checkbox"/> (c) 1                      <input type="checkbox"/> (d) 1.25</p>
18.	<p>The aggregate demand curve tells us possible:</p> <p><input type="checkbox"/> (a) combinations of <math>M</math> and <math>Y</math> for a given value of <math>P</math>.</p> <p><input type="checkbox"/> (b) combinations of <math>M</math> and <math>P</math> for a given value of <math>Y</math>.</p> <p><input type="checkbox"/> (c) combinations of <math>P</math> and <math>Y</math> for a given value of <math>M</math>.</p> <p><input type="checkbox"/> (d) results if the Federal Reserve reduces the money supply.</p>
19.	<p>Assume that we have a demand curve of the form <math>\ln q = a - b \ln p</math>. Then the elasticity of demand is</p> <p><input type="checkbox"/> (a) Always increasing with <math>p</math>    <input type="checkbox"/> (b) Decreasing with <math>p</math>                      <input type="checkbox"/> (c) Constant    <input type="checkbox"/> (d) None of the above.</p>
20.	<p>In the Kinked Demand Curve Model, suppose MC curve shifts upward in the discontinuous range of MR curve. Which one of the following is correct? At equilibrium,</p> <p><input type="checkbox"/> (a) price rises but quantity remains the same                      <input type="checkbox"/> (b) price and quantity both remain the same</p> <p><input type="checkbox"/> (c) quantify rises but price remains the same                      <input type="checkbox"/> (d) price and quantity both rise</p>

**Madras School of Economics**

**Entrance Examination in Masters Programme**

Solution Key to Mathematics, Statistics & Economics Questions

**Mathematics**

1. (a)  $\frac{d}{dx}(5x^3) = 15x^2, \frac{d}{dx}(15x^2) = 30x, \frac{d}{dx}(30x) = 30.$

2. (a)  $AB = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ -1 & 0 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 5 & 1 \\ 7 & 0 \end{bmatrix}$

3. (b)  $\lim_{x \rightarrow 5}(3x^3 + 5x^2 - 2x + 3) = 493.$

4. (c)  $\text{Adj}A = \begin{bmatrix} 1 & 1 & -1 \\ -3 & 1 & 1 \\ 9 & -8 & 2 \end{bmatrix}, \det(A) = 2.$

So,  $A^{-1} = \frac{\text{Adj}A}{|A|} = \begin{bmatrix} 1/2 & 1/2 & -1/2 \\ -3/2 & 1/2 & 1/2 \\ 9/2 & -8/2 & 2/2 \end{bmatrix}$

So,  $A^{-1}A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I.$

5. (d)  $3 < x \leq 5.$  So,  $x = 4.35.$

**Statistics**

6. (a) Probability of sure event is 1.
7. (c) In the word 'PROBABILITY' there are 4 vowels. So, the probability that a randomly chosen word is vowel is  $\frac{4}{11}$ .
8. (a)  $P(A \cap B) = P(A)P(B)$ , since A and B are independent event.
9. (b)  $P(1/2 < X < 1) = F(1) - F(1/2)$ .
10. (d)  $\text{Var}(\text{Old}) = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x}_1)^2$ , now a constant vale 4 is subtracted from each observation of a set, then  $\bar{x}_2 = \bar{x}_1 - 4$ .
- $$\text{Var}(\text{New}) = \frac{1}{n} \sum_{i=1}^n (x_i - 4 - (\bar{x}_1 - 4))^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x}_1)^2$$
- $$= \text{Var}(\text{old}) .$$

**Advanced Mathematics**

11. (b) Here  $\det(A) = 0 \gg A$  is not invertible.
12. (c)  $r(-2) = 0$ ,  $p(-2) = 0$ ,  $s(-2) \neq 0$ ,  $q(-2) = 0$ .
- So,  $s(x)$  leaves remainder when divided by  $(x+2)$ .
13. (c)  $|A - \lambda I| = 0 \gg \begin{bmatrix} 6 - \lambda & 6 \\ 6 & 3 - \lambda \end{bmatrix} = 0$
- $$\gg (\lambda + 6)(\lambda - 9) = 0 \gg \lambda = 9, -6.$$
14. (c)  $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 1} - \sqrt{x^2 - 1}) = \lim_{x \rightarrow \infty} \frac{2}{\sqrt{x^2 + 1} + \sqrt{x^2 - 1}} = 0$ .
15. Very Easy. Do Yourself.

Economics

16. (d) The Classical Quantity Theory of Money assumes that the money supply is constant.

17. (d) Here we will use Laspeyre's Index Number Formulae. Given that  $p_{01} = 0.5$ ,  $p_{11} = 1$ ,  $p_{02} = 1$ ,  $p_{12} = 0.5$ ,  $q_{01} = 10$ ,  $q_{02} = 5$

[ 0 : base year, 1 : Current year ] So,  $L_{01} = \frac{q_{01}p_{11} + q_{02}p_{12}}{q_{01}p_{01} + q_{02}p_{02}} = 1.25$ .

18. (c) The aggregate demand curve tells us possible combination of P and Y for a given value of M.

19. (b) Here  $\ln q = a - b \ln p$ , differentiating w.r.t. p, we have

$$\frac{1}{q} \cdot \frac{dq}{dp} = -\frac{b}{p} \gg \frac{p}{q} \cdot \frac{dq}{dp} = -b, \text{Elasticity of demand} = -b.$$

20. (b) There is no change in price & quantity, both remain the same.