

Studymate Practice Boards Paper
Class – XII

Code No. 30/1

Reg. No.

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Candidates must write the Code on the title page of the answer-book.

- ▶ Please check that this question paper contains 5 printed pages.
- ▶ Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- ▶ Please check that this question paper contains 24 questions.
- ▶ Please write down the Serial Number of the questions before attempting it.
- ▶ 15 minutes time has been allotted to read this question paper. The student will read the question paper only and will not write any answer on the answer script during this period.

Economics

Time allowed : 3 hours

Maximum marks : 80

General Instructions:

- (i) All questions are compulsory
- (ii) Question No. 1-4 and 13-16 are very short answer questions carrying 1 mark each. They should not exceed single sentence.
- (iii) Question No.5-6 and 17-18 are short answer questions carrying 3 marks each. They should not normally exceed 60 words.
- (iv) Question No. 7-9 and 19-21 are short answer questions carrying 4 marks each. They should not exceed 70 words.
- (v) Question No.10-12 and 22-24 are long answer questions carrying 6 marks each. They should not exceed 100 words normally.

Section A – Micro Economics

1. In an imperfectly competitive market, total product must also decline when MP is declining. True or False. Give reason.
2. Short run average cost of producing two units of a commodity is Rs. 30. If addition to total cost of producing the third unit is Rs. 10, then
 - (a) Average cost will rise.
 - (b) Average cost will fall.
 - (c) Marginal cost will rise.
 - (d) Average cost will remain same.
3. If slope of TR is constant MR will:
 - (a) be equal to zero
 - (b) increase at increasing rate
 - (c) be constant
 - (d) Increase at diminishing rate
4. "Healthcare service provided by the government increases public expenditure". Is it a positive or normative statement?
5. What will be the impact of each of the following on demand curve of mobile Samsung J7 if:
 - (a) Price of Moto G5+ falls.
 - (b) Tech news commented that Moto G5+ had heating problem when GPS is active, which made usage difficult.
 - (c) Price of Samsung J7 falls.
6. Recently Government of India has launched "Integrated Child Development Programme Scheme (ICDS)". A unique programme under which a package of integrated services consisting of supplementary nutrition, immunisation, health check up and education services are provided to the most vulnerable groups of children (upto 6 years). Explain its impact on the PPC.

OR

Draft a hypothetical schedule for a production possibility curve of an economy where the resources are equally efficient in production of both the goods. Draw PPC as well.

7. A consumer consumes only two goods burger and cake. Show that when price of cake falls, demand for cake rises. Answer this question with the help of utility analysis.
8. "Consumer Affairs Minister Ram Vilas Paswan has said that state run MMTTC will import 2,000 tonnes of onion."
Analyse the impact of the above statement on the market of onions (showing chain effects) and diagram.

OR

Identify the market form for each of the commodity and explain two features of each:

- (a) The market for detergents in India.
- (b) The market for mobile services providers in India.
9. (a) The price elasticity of supply of commodity Y is half the price elasticity of supply of commodity X. 16 percent rise in the price of X results in a 40 percent rise in its supply. If the price of Y falls by 8 percent, calculate the percentage fall in its supply.
(b) What will be the slope of demand curve if:
 - (i) demand curve is perfectly elastic.
 - (ii) demand curve is perfectly inelastic.
10. State with valid reasons, which of the following statements are true and false:
 - (a) In the short run production function, factor ratio remains same at different levels of output.

- (b) When total revenue is constant, average revenue will be zero.
- (c) There is no cost incurred by a producer on the capital if he uses his own savings deposited in the bank to buy it.
- (d) Average variable cost is an inverse U-shaped curve.
- (e) Average fixed cost continuously increases with decrease in output.
- (f) Marginal cost is affected only by variable cost.

11. Suppose the demand and supply curves of salt is given by

$$Q^D = 1000 - p \qquad Q^S = 700 + 2p$$

- (a) Find the equilibrium price and quantity.
- (b) Now suppose the income of the consumer rises so that the new demand is $Q^D = 1300 - p$. How does the equilibrium price and quantity change?
- (c) Suppose the government imposes a tax of Rs. 3 per unit on sale of salt. How does it affect the equilibrium price and quantity?

12. (a) If slope of budget line is 3 and slope of indifference curve is 4, is the consumer in equilibrium? Give reasons.

What will a rational consumer do in this situation? Use ordinal utility analysis.

- (b) Marginal utility schedule of individual A is given below. Further assume that marginal utility of money for the consumer = 4 utils

<i>Units of Commodity (X)</i>	<i>MU_x (Units)</i>
1	20
2	18
3	16
4	10
5	0
6	-5

- (i) How many units will a consumer buy if the commodity is given free to him without any price?
- (ii) How many units will he buy if the price of a commodity is Rs. 2.50? Give reason.

OR

Different combinations of Good X and Good Y between which a consumer is indifferent are given below:

<i>Combination</i>	<i>Units of Good X</i>	<i>Units of Good Y</i>
A	1	14
B	2	10
C	3	7
D	4	5
E	5	4

Answer the following questions

- (a) Calculate the rate at which consumer is willing to sacrifice units of Goods Y to gain one more unit of Good X. (From combinations A to E)
- (b) Assuming that a consumer has a budget of Rs. 26 to be spent on Good X and Good Y. Also assuming Price of Good X = 4 and Price of Good Y = 2, how many units will a consumer buy of Good X and Good Y to be in equilibrium and why?

Section B – Macro Economics

13. Penalties imposed by courts for non-compliance with order are
 (a) forfeitures (b) Fines (c) Fees (d) All of them
14. Money supply includes time deposits of the people with the commercial banks. True or False.
15. Government imposes 10% surcharge on those individuals whose income is more than 1 crore per annum. Which budgetary objective is fulfilled by government from this step?
16. Name the monetary measure indicated in the following statement:
 'Instead of 80%, now 90% of the security amount will be given as loan'.
17. If in an economy, autonomous consumption and autonomous investment is equal to 300 crores. Marginal propensity to consume is two third of marginal propensity to save. Answer the following questions:
 (a) Will an economy be in equilibrium at an income level of Rs. 1200 crore.
 (b) What is the value of unplanned inventories at an income of Rs. 1200 crores?
18. Derive a saving curve using the following consumption function $C = 200 + 0.75Y$.
 Also show the level of income where savings are zero.

OR

Explain the concept of 'deficient demand' using diagram in macro-economics. How much investment should be undertaken by the government to overcome it?

19. Calculate revenue deficit and primary deficit.

Particulars	Rs. in Lakhs
(a) Tax receipts	40
(b) Recoveries of loans	45
(c) Receipts from sale of PSU	50
(d) Capital expenditure	110
(e) Interest payments	10
(f) Revenue expenditure	100
(g) Interest and dividend receipts	15
(h) Administrative revenue and other receipts	35

20. Only one product X is produced in the country. Its output during the year 2015 and 2016 was 200 units and 220 units respectively. The market price of product X during the year was Rs. 100 and Rs. 110 per unit respectively. Calculate the
 (a) Percentage change in real GDP. (b) GDP deflator for year 2016.
21. How will the following measures taken up by RBI affect the availability of credit in the economy?
 (a) Reverse repo rate increased from 5.75% to 6%.
 (b) Cash reserve ratio is reduced from 4.25% to 4%.

OR

Central Bank issues currency but it is commercial banks which create credit. Explain the process of credit creation by commercial banks if initial deposit is Rs. 1000 crore and CRR = 4%, SLR = 16%.

22. Calculate:
 (a) Gross domestic product at market price with income and expenditure method
 (b) Factor income from abroad for the following data.

Particulars	Rs. in crore
(i) Private final consumption expenditure	1260
(ii) Corporate tax	160
(iii) Interest	400
(iv) Exports	40
(v) Dividends	200
(vi) Compensation of employees	1500
(vii) Gross national product at factor cost	2800
(viii) Undistributed profits	140
(ix) Actual rent	250
(x) Imputed rent of owner occupied dwelling	50
(xi) Net indirect taxes	250
(xii) Net current transfers from rest of the world	90
(xiii) Change in stock	50
(xiv) Factor income to abroad	120
(xv) Net domestic capital formation	650
(xvi) Gross fixed capital formation	700
(xvii) Government final consumption expenditure	1000

OR

Will the following items be included in domestic income of India? Give reasons for your answer:

- Compensation received by Priyanka Chopra from Hollywood director for acting in his film.
- Interest paid by a household on a loan taken by him to buy refrigerator.
- Salaries received by Indian resident working in Australian Embassy in India.
- Earnings of a self employed doctor having a clinic at his residence.
- Insurance premium paid by an employee to an insurance company.
- Expenditure of government on subsidies given on LPG cylinders to reduce its price.

23. Giving reasons, state whether the following statements are true or false:

- Aggregate demand will have parallel shift upwards if MPC of an economy rises.
- There will be no change in real output due to excess demand in an economy.
- The minimum value of multiplier is zero.
- During deficient demand equilibrium is determined at full employment level.

24. (a) The government of India launched the "Incredible India" campaign to promote tourism in India. How will this affect the price of foreign exchange?

(b) What will be the impact on the demand of foreign exchange if exchange rate changes from Rs. 65/\$ to Rs. 68/\$?

(c) In BOP account of an imaginary economy, if autonomous receipts = \$120 and autonomous payments = \$100, what can be said about the state of BOP in this economy? Explain the transactions that will be taken up by the central bank to correct this imbalance in BOP account.



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Studymate Practice Boards Paper
Class – XII

Code No. 67/1

Reg. No.

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Candidates must write the Code on the title page of the answer-book.

- ▶ Please check that this question paper contains 6 printed pages.
- ▶ Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- ▶ Please check that this question paper contains 13 questions.
- ▶ Please write down the Serial Number of the questions before attempting it.
- ▶ 15 minutes time has been allotted to read this question paper. The student will read the question paper only and will not write any answer on the answer script during this period.

English (Core)

Time allowed : 3 hours

Maximum marks : 100

General Instructions:

- (i) All questions are compulsory.
- (ii) This paper is divided into three sections A, B and C. All the sections are compulsory.
- (iii) Separate instructions are given with each section and question, wherever necessary. Read these instructions very carefully and follow them faithfully.
- (iv) Do not exceed the prescribed word limit while answering the questions.

1. Read the following passage carefully and answer the questions that follow: [12]

Burning with a desire for vengeance and vindication, I applied myself to gaining entry to the Culinary Institute of America (CIA) in Hyde Park, New York. My friends — those who remained on speaking terms with me after two years of truly disgusting behaviour on my part — thought I was out of my mind, but then they thought that anyway. I'd love to tell you it was tough getting into CIA. There was a long waiting list. But I reached out to a friend of a friend who'd donated some money to the school and owned a well-known restaurant in New York City, and about two weeks after filling out my application I was in. I was an enrolled student at an institution where everyone wore identical white uniforms, funny paper hats and actually had to attend class. But I was ready. CIA is located in the buildings and grounds of a former Jesuit monastery on a Hudson River cliff-top, a short cab ride from Poughkeepsie. In my buttoned-up chef's coat, check pants, neckerchief and standard-issue leatherette knife roll-up, I arrived determined but full of attitude. The first few months at CIA were spent on stuff like, 'This is the chef's knife. This is the handle. This is the blade,' as well as rote business on sanitation. My food sanitation instructor, an embittered ex-health inspector (judging from the scars on his face, the last honest man in that trade), regaled us with stories of pesticide-munching super rats, the life cycle of bacteria and the ever-present dangers of unseen filth.

I took classes in food-handling, egg cookery, salads, stocks, soups, basic knife work. But after spending way too many hours peeling potatoes, making gallons of dressings, chopping vegetables and so on, I knew this stuff in my bones. That is the reason my food in class always tasted far better than my classmates.

The chef/instructors were largely, it seemed, burn-outs from the industry: bleary-eyed Swiss, Austrian and French ex-cronies with some motivated veterans of major hotel chains, for whom food was all about cost per unit. But it was fun. Pulled sugar, making decorations using sugar, ice-carving, you don't see a lot of that in the real world, and there were some really talented, very experienced old-school people at CIA who passed on to their adoring students the last of a dying style. They'd let us practice our knife work on whole legs of beef, my novice butcher classmates and I absolutely destroying thousands of pounds of meat; we were the culinary version of the Manson Family. Fortunately, the mutilated remains of our efforts were—as was all food at CIA— simply passed along to another class, where it was braised, stewed or made into soup or grinding meat . . . before ending up on our tables for dinner. They had figured out this equation really well. All students were either cooking for other students, serving other students or being fed by other students—a perfect food cycle, as we devoured our mistakes and our successes alike.

Barring a few incidents, one fine day, sometime later, I did get my diploma. I was now a graduate of the best cooking school in the country—a valuable commodity on the open market—I had field experience, a vocabulary and an experimental mind. On the strength of my diploma - and my willingness to work for peanuts - I landed a job almost right away at the venerable New York institution, the Rainbow Room, high at the top of the Rockefeller Center. It was my first experience of the real Big Time, one of the biggest, busiest and best-known restaurants in the country. I was willing to do anything to prove myself, and when I got in that elevator to the sixty-fourth floor kitchen for the first time, I felt as if I was blasting off to the moon. The Rainbow Room at that time sat a little over 200 people. The Rainbow Grill sat about another 150. Added to that were two lounges where food was available, and an entire floor of banquet rooms - all of it serviced simultaneously by a single, central kitchen. So you had some major league volume, as well as some major league cooks to go along with it.

A long hot line of glowing flat-tops ran along one wall, flames actually roaring back up into a fire wall behind them. A few feet across, separated by a narrow, trench-like workspace, ran an equally long stainless-steel counter. Much of this counter was taken up by vast, open steam boilers which were kept at a constant, rolling boil. What the cooks had to contend with was a long, uninterrupted slot, with no air circulation, with nearly unbearable, dry, radiant heat on one side and clouds of wet steam heat on the other. When I say unbearable, I mean they couldn't bear it; cooks would regularly pass out and have to be dragged off to recuperate.

There was so much heat coming off those ranges - especially when the centre rings were lit

for direct fire - that the filters in the overhead hoods would often burst into flames, inspiring a somewhat comical scene as the overweight Italian chef would hurl himself down the narrow line with a fire extinguisher, bowling over the cooks and tripping as he hurried to put out the flames before the central system went off and filled the entire kitchen with fire-suppressant foam.

As I've said, it was hot. Ten minutes into the shift, the cheap polyester whites we all wore would be soaked through with sweat, clinging to chest and back. All the cooks' necks and wrists were pink and inflamed with awful heat rashes. It was a madhouse.

(Source: Kitchen Confidential by Anthony Bourdain)

1.1 On the basis of your understanding of this passage, answer the following questions with the help of given options: **[1 × 4 = 4]**

- (a) Why were most of Anthony's friends not on speaking terms with him?
 (i) Because he was more talented. (ii) Because of his disgusting behaviour.
 (iii) Because he was more successful. (iv) All of the above.
- (b) Why did Anthony's food taste better?
 (i) Because of his thorough knowledge
 (ii) Because of his aptitude for cooking
 (iii) Because of extra classes from the teachers
 (iv) Both (i) and (iii)
- (c) What happened to the remains of Anthony and his classmates 'culinary skills'?
 (i) It ended up as their dinner. (ii) It ended up as food for the diners.
 (iii) It was sold at a cheap rate. (iv) It was served to the poor.
- (d) Why would the cooks regularly pass out in the Rainbow Room kitchen?
 (i) Because of too much work (ii) Because of getting less food
 (iii) Because of the high heat (iv) Both (i) and (ii)

1.2 Answer the following questions briefly: **[1 × 6 = 6]**

- (a) How did Anthony get admission into CIA?
 (b) Who were the chef/ instructors at CIA?
 (c) How did Anthony land a job in the Rainbow Room?
 (d) What does the narrator mean by 'I felt as if I was blasting off to the moon'?
 (e) In what way was the employees' workspace 'trench-like'?
 (f) What was 'comical' about the scene of the chef and his fire extinguisher?
 (g) Find words from the passage which mean the same as: **[1 × 2 = 2]**
 (i) Entertained (para 2) (ii) Respected (para 6)

2. Read the passage given below: **[10]**

Invictus: The Unconquerable – by W.E. Henley

1. Out of the night that covers me.
2. Black as the pit from pole to pole.
3. I thank whatever gods may be
4. For my unconquerable soul.
5. In the fell clutch of circumstances
6. I have not winced nor cried aloud,
7. Under the bludgeonings of chance
8. My head is bloody, but unbowed.
9. Beyond this place of wrath and tears
10. Looms but the horror of the shade.

-
11. And yet the menace of the years.
 12. Finds, and shall find me, unafraid.
 13. It matters not how strait the gate,
 14. How charged with punishments the scroll,
 15. I am the master of my fate:
 16. I am the captain of my soul.

2.1 On the basis of your understanding of the above passage, answer the questions that follow with the help of given options. **[1 × 2 = 2]**

- (a) What does the poet thank Gods for?
- | | |
|------------------------|-------------------------|
| (i) Painful situations | (ii) Unconquerable soul |
| (iii) Dark night | (iv) Wrath and tears |
- (b) How has the problems of the various years found the poet?
- | | | | |
|--------------|-------------|--------------|---------------|
| (i) Unafraid | (ii) Shaken | (iii) Broken | (iv) Peaceful |
|--------------|-------------|--------------|---------------|

2.2 Answer the following as briefly as possible:

- (c) What does the poet wish to convey by 'Horror of the shade' (line 10)? **[1]**
- (d) Why is the poet's head bloody? **[1]**
- (e) The word 'charged' (line 14) has several meanings. What does the poet intend it to mean? **[1]**
- (f) What is the theme of the poem? **[1]**
- (g) What do the following metaphors signify in the poem? **[4]**
- | | |
|-------------|--------------------------|
| (i) Night | (ii) Circumstance |
| (iii) Shade | (iv) Menace of the years |

3. Read the passage given below: **[8]**

While the countenance of a young chimpanzee may not reveal it, chimpanzees are our closest genetic relatives. When one examines the behaviour of chimpanzees, the similarities to humans abound. Studies reveal that the developmental cycle of a chimpanzee parallels that of a human. In the wild, chimpanzees nurse for five years and are considered young adults at age 13. Mothers typically share life-long bonds with their adult sons and daughters. Chimpanzees communicate nonver- bally, using humanlike interactions such as hugs, kisses, pats on the back, and tickling. Many chimpanzee emotions, such as joy, sadness, fear, boredom, and depression, are comparable to human emotions.

Chimpanzees are currently found living freely in 21 African countries, from the west coast of the continent to the eastern African nations of Uganda, Rwanda, Burundi, and Tanzania. However, chimpanzees are disappearing from their natural habitats in Africa. Several factors are responsible. Africa currently has one of the highest growth rates in the world, and the exploding human population is creating a snowballing demand for the limited natural resources. Forests, the preferred habitat of the chimpanzee, are razed for living space, crop growing, and grazing for domestic livestock. Consequently, the habitat of the chimpanzee is shrinking and becoming fragmented. Since logging is the primary economic activity in the forests of central Africa, providing many jobs and improving the livelihoods of poor, rural populations, the fate of chimpanzees living in the wild does not look promising. Their outcome is further impacted by poachers who abduct baby chimpanzees (usually killing protective adults in the process) and sell them to dealers for resale as pets or performers. Increased legislative restrictions and penalties have reduced the export of young chimpanzees, 'but the threat has by no means vanished: approximately 10,000 wild-caught chimpanzees were exported from Africa in the past decade.

- (A) On the basis of your reading of the above passage make notes on it, using headings and sub-headings. Use recognisable abbreviations (wherever necessary—minimum four) and a format you consider suitable. Also supply an appropriate title to it. **[5]**
- (B) Write a summary of the passage in about 80 words. **[3]**

4. Principal, Sunrise Global School, Agra requires a receptionist for her school. Draft a suitable advertisement in about 50 words to be published in the classified columns of a national newspaper giving all the necessary details of qualifications and experience required in the receptionist. [4]

OR

Water supply will be suspended for eight hours (10 am to 6 pm) on 6th of March for cleaning of the water tank. Write a notice in about 50 words advising the residents to store water for a day. You are Karan Kumar/Karuna Bajaj, Secretary, Janata Group Housing Society, Palam Vihar, Kumool.

5. Every day many innocent lives are lost because of drunken and reckless driving on city roads. Write a letter to the editor of a local newspaper suggesting ways to curb this menace. You are Amit/Amita of Sector 12, Dwarka. (Word limit: 120-150) [6]

OR

After your exams are over, you want to utilize your time during the summer vacation by working in a leading chain of restaurants. You are Ranjeet/Ranjana residing at 214 Lodhi Road, New Delhi. Write an application for the post of a Supervisor giving your complete bio-data to the BR Manager Subways, GK Part II, New Delhi. (Word limit: 120-150)

6. India is a land of diversity. One way in which it makes us feel proud of it is the number of festivals we enjoy. Write an article in 150-200 words on 'Festivals of India'. You are Karuna/Karan. [10]

OR

Rising pollution, fast and competitive lifestyle, lack of nutritious food etc. have caused health woes for a large section of our population. Providing health care used to be a charitable and ethical activity. Today it has become commercialized, a money spinning business. Write an article in 150-200 words on 'How to provide proper health care to the common man'. You are Karan/Karuna.

7. 'The policy of reservation of seats for admission to the professional courses is good for the deprived sections of society.'

Write a debate in 150-200 words either for or against the motion. [10]

OR

Write a speech in 150-200 words on 'Benefits of early rising' to be delivered by you in the morning assembly of your school. You are Karuna/Karan, Head Girl/Head Boy.

8. Read the extract given below and briefly answer the questions that follow: [4]

'Far far from the gusty waves these children's faces.

Like rootless weeds, the hair torn around their pallor:

The tall girl with her weighed - down head.

The paper-seeming boy, with rat's eyes.

The Stunted unlucky heir

Of twisted bones, reciting a father's gnarled disease,

His lesson, from his desk'

(i) How do the faces of the children look? What is the comparison the poet shows here? [2]

(ii) Why is the head of the tall girl 'weighed down'? [1]

(iii) Why is the boy called an 'unlucky heir'? What is he 'reciting'? [1]

OR

'.....Such the sun, the moon,

Trees old, and young, sprouting a shady boon

For simple sheep; and such are daffodils

With the green world they live in; and clear rills

That for themselves a cooling covert make

'Gainst the hot season; the mid-forest brake,

Rich with a sprinkling of fair musk-rose blooms;'

(i) What sprouts a shady boon and for whom? [1]

(ii) How do 'clear rills' and the 'mid-forest brake' enrich their environment? [1]

(iii) What message do the above lines convey? [2]

9. Answer any four of the following in 30—40 words each: [3 × 4 = 12]

(a) The people in the story suddenly realise how precious their language is to them. What shows you this? Why does this happen?

(b) 'And then in the midst of the terror came a touch of reason.' What was that and did it succeed?

(c) Why did Gandhi agree to a settlement of 25 per cent refund to the farmers?

(d) Mr. Lamb says to Derry: 'It's all relative. Beauty and the beast'. What does he mean by that?

(e) What made Jack realise that his custom of telling a story was turning futile?

(f) Did the injured McLeery help the prison officers track Evans?

10. Answer the following in 120-150 words: [6]

Fantasy is a pleasant relief at times but at times it can take a serious turn, which may prove detrimental to mental growth. Elucidate with reference to the text focusing on the character of Sophie and Jansie.

OR

What were the various issues touched upon by John Updike by incorporating a narrative within a narrative?

11. Answer the following in 120-150 words: [6]

Untouchability is not only a crime. It is inhuman too. Why and how did Bama decide to fight against it?

OR

Good human values are far above any other value system. How did Dr. Sadao succeed as a doctor as well as a patriot?

12. Answer the following in 120-150 words: [6]

What were Griffins plans before meeting Dr. Kemp? How did they change after meeting him?

OR

What did Mr. and Mrs. Hall experience when they entered the room of the stranger?

13. Answer the following in 120-150 words: [6]

Was there any good that had come from the theft in Silas Marner's house for Silas? Enumerate.

OR

How does Godfrey break the news to the Squire about his giving the money which he had taken from Fowler to Dunstan?



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Studymate Practice Boards Paper
Class – XII

Code No. 41/1

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Candidates must write the Code on the title page of the answer-book.

- ▶ Please check that this question paper contains 4 printed pages.
- ▶ Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- ▶ Please check that this question paper contains 29 questions.
- ▶ Please write down the Serial Number of the questions before attempting it.
- ▶ 15 minutes time has been allotted to read this question paper. The student will read the question paper only and will not write any answer on the answer script during this period.

Mathematics

Time allowed : 3 hours

Maximum marks : 100

General Instructions:

- (i) All questions are compulsory.
- (ii) This question paper contains 29 questions.
- (iii) Question 1- 4 in Section A are very short-answer type questions carrying 1 mark each.
- (iv) Questions 5-12 in Section B are short-answer type questions carrying 2 marks each.
- (v) Questions 13-23 in Section C are long-answer-I type questions carrying 4 marks each.
- (vi) Questions 24-29 in Section D are long-answer-II type questions carrying 6 marks each.

Section - A

1. Find λ^2 if the vectors $\hat{i} - \hat{j} + \hat{k}$, $3\hat{i} - \hat{j} + 2\hat{k}$, and $\hat{i} + \lambda\hat{j} - 3\hat{k}$ are coplanar.
2. For a matrix A of order n , given that $|A| = 4$, if $|\text{Adj } A| = 16$, find the value of n .
3. Given that the relation R in the set $A = \{1, 2, 3, \dots, 100\}$ given by $R = \{(x, y) : xy \text{ is a perfect square}\}$ is an equivalence relation. Obtain the equivalence class $[2]$.
4. Find the number of binary operations on the set $\left\{\sqrt{2} + 1, \frac{1}{\sqrt{2} + 1}\right\}$.

Section - B

5. Evaluate $\sin(3 \sin^{-1}(0.4))$
6. If A and B are invertible matrices of the same order then prove that $(AB)^{-1} = B^{-1}A^{-1}$.
7. If $\sin^{-1}\left(\frac{1}{3}\right) = \cos^{-1}(\lambda)$ then find the value of λ . Hence find the value of $\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right) + \sin^{-1}\left(\frac{1}{3}\right)$.
8. For the curve $y = 5x - 2x^3$, if x increase at the rate of 2 units/sec, then how fast is the slope of curve changing when $x = 3$?
9. Evaluate $\int_{-1}^1 \log\left(\frac{2-x}{2+x}\right) dx$.
10. Find the equation of the curve passing through the point $(0, 1)$ given that the slope of the tangent to the curve at any point (x, y) is equal to the product of twice the abscissa and thrice the ordinate of the coordinates of the point of tangency.
11. Show that the area of a parallelogram, whose diagonals are given by \vec{d}_1 and \vec{d}_2 is $\frac{|\vec{d}_1 \times \vec{d}_2|}{2}$.
12. A problem in mathematics is given to 3 students whose chances of not solving it are $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$. What is the probability that the problem is solved?

Section - C

13. Given the determinant $\Delta = \begin{vmatrix} x & x^2 & 1 + px^3 \\ y & y^2 & 1 + py^3 \\ z & z^2 & 1 + pz^3 \end{vmatrix}$. Find four conditions which make $\Delta = 0$.
14. Find the values of p and q so that $f(x) = \begin{cases} x^2 + 3x + p, & x \leq 1 \\ qx + 2, & x > 1 \end{cases}$ is differentiable at $x = 1$.

OR

If the function f is continuous at $x = 0$, find the values of 'a' and 'b' where $f(x)$ is defined as:

$$f(x) = \begin{cases} \frac{\log(1+ax) - \log(1+3x)}{x} & ; \text{ if } x < 0 \\ 1 & ; \text{ if } x = 0 \\ \frac{\sin^2 bx}{x^2} & ; \text{ if } x > 0 \end{cases}$$

15. If $\sqrt{y} = \tan^{-1} x$ then prove that $(x^2 + 1)^2 \frac{d^2y}{dx^2} + 2x(x^2 + 1) \frac{dy}{dx} = 2$.
16. Find the intervals in which the function f given by $f(x) = \frac{4 \sin x - 2x - x \cos x}{2 + \cos x}$, $x \in [0, 2\pi]$ is
- (i) increasing (ii) decreasing

OR

If the straight line $x \cos \alpha + y \sin \alpha = p$ touches the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then prove that:

$$a^2 \cos^2 \alpha + b^2 \sin^2 \alpha = p^2$$

17. A telephone company in a town has 500 subscribers on its list and collects fixed charges of Rs. 300 per subscriber. The company proposes to increase the annual subscription and it is believed that every increase of Rs. 1, one subscriber will discontinue the service. Find what increase will bring maximum revenue?
18. Evaluate: $\int \frac{1}{\cos(x+a)\cos(x+b)} dx$
19. Find the general solution of the differential equation $\frac{dy}{dx} - y = \cos x$.

OR

If $y(x)$ is a solution to the differential equation $\left(\frac{2 + \sin x}{1 + y} \right) \frac{dy}{dx} = -\cos x$ and $y(0) = 1$ then find the value of $y\left(\frac{\pi}{2}\right)$.

20. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $|\vec{a} + \vec{b} + \vec{c}| = 1, \vec{c} = \lambda(\vec{a} \times \vec{b})$ and $|\vec{a}| = \frac{1}{\sqrt{2}}, |\vec{b}| = \frac{1}{\sqrt{3}}, |\vec{c}| = \frac{1}{\sqrt{6}}$, find the angle between \vec{a} and \vec{b} .
21. Find the equation of the plane through the intersection of the planes $\vec{r} \cdot (\hat{i} + 3\hat{j}) - 6 = 0$ and $\vec{r} \cdot (3\hat{i} - \hat{j} - 4\hat{k}) = 0$, whose perpendicular distance from origin is unity.
22. If a machine is correctly setup, it produces 90% acceptable items. If it is incorrectly setup, it produces only 40% acceptable items. Past experience shows that 80% of the setup are correctly done. If after a certain setup, the machine produces 2 acceptable items, find the probability that machine is correctly setup. What according to you is the importance of industrial training in development of skill needed for working with tools and machines?
23. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails. Also find the mathematical expectation and the standard deviation of the distribution.

Section - D

24. Let $f: (0, \infty) \rightarrow R$ be a function defined by $f(x) = 9x^2 + 6x - 5$. Prove f is not invertible. Modify only codomain of f to make f invertible and then find its inverse.

OR

Let $A = N \cup \{0\} \times N \cup \{0\}$ and let '*' be a binary operation on A defined by

$(a, b) * (c, d) = (a + c, b + d)$ for all $(a, b), (c, d) \in A$. Show that (i) '*' is commutative on A. (ii) '*' is associative on A. Also find the identity element of A, if any.

25. If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$, find inverse of A using elementary transformations and hence solve the following

matrix equation, $XA = B$, where $B = [1 \quad 3 \quad -2]$

26. Evaluate $\int_0^{10} |x - 5| dx$. Draw the graph of $f(x) = |x - 5|$. What does the value of the integral represent on the graph?
27. Evaluate : $\int_0^\pi \frac{x dx}{a^2 \cos^2 x + b^2 \sin^2 x}$

OR

Evaluate $\int_0^1 (3x^2 + 2x + 1)dx$ as limit of sum.

28. Prove that the lines $\vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$ and $\vec{r} = 3\hat{i} + 2\hat{j} - 5\hat{k} + \mu(-2\hat{i} + 3\hat{j} + 8\hat{k})$ lie on a plane. Also find equation of the plane.
29. An aeroplane can carry a maximum of 200 passengers. A profit of Rs. 1000 is made on each first class ticket and a profit of Rs. 600 on each economy class ticket. The airline reserves atleast 20 seats for first class. However, atleast 4 times as any passengers prefer to travel by economy class than 1st class. Form a LPP to determine how many tickets of each type must be sold to maximum profit.

OR

There are two factories located one at place P and the other at place Q. From these locations, a certain commodity is to be delivered to each of the three depots situated at A, B and C. The weekly requirements of the depots are respectively 5, 5 and 4 units of the commodity while the production capacity of the factories at P and Q are respectively 8 and 6 units. The cost of transportation per unit is given below:

From/To	Cost (in Rs)		
	A	B	C
P	160	100	150
Q	100	120	100

How many units should be transported from each factory to each depot in order that the transportation cost is minimum. What will be the minimum transportation cost?

