

No. 90081

GENERAL ENGLISH

Marks : 200

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **all** questions

1. Make a précis of the following passage in your own words, reducing it to about 90 words and provide a suitable title. Write your précis on the special sheet provided for this purpose : 50

In the 21st century, technology has revolutionized every aspect of our lives. Use of electronic mail (e-mail) has been widespread for more than a decade. Smartphones connect us with people around the world. Telecommunications have had profound effects on the organization of urban space. Although large cities typically have much better developed telecommunication infrastructures than do small ones, the technology has rapidly diffused through most national urban hierarchies. All these act as evidence that we are living in an era of unprecedented technological advancement.

While technology has made it easier to connect with others, access information, and improve medical care, it has also led to job loss, cyberbullying, and technology addiction. As we move forward, it will be essential to consider the potential impacts of new technological advancements and work to mitigate any negative effects.

2. Write an essay on any *one* of the following topics : 50

- (a) The status of health care in rural Meghalaya
- (b) Reducing the language divide : A greater need for language flexibility in the era of progress
- (c) Artificial intelligence as a potential threat to human workforce
- (d) The dangers of Digital India in the face of cybercrime
- (e) Vocational education as an opportunity for employment in the present century

3. Draft a letter to the Editor expressing your concern over the rise of drug abuse amongst the youth in Shillong.

50

4. Read the passage carefully and answer the given questions :

In the fast-paced 21st Century, we need to work hard, but 'smartly'. Bill Gates said that he would choose a lazy person to do a difficult job because he would find a way to accomplish it easily. Hard work helps you to solve the instant problems of our life while overlooking the root of it. Smart work helps you to find the root of the problem and helps you to eliminate it.

One very important life management skill is time management. Smart workers are very well aware that time is the most precious resource they have. They value their time the most in life. Thus, smart workers learn how to manage their time wisely.

You can drown in opportunities. Therefore, smart workers very carefully select the opportunities they engage with. They have no problem saying no. They are patient and wait for the one right thing with low risk and massive potential return. It is called value investing and your time is the most precious resource you can invest. Your energy and resources are very limited, thus as a smart worker you have to choose your battles very carefully.

Smart work is the fruit of hard work. And to master the qualities of smart work, one needs to work really hard in the beginning.

The planning is the biggest difference between hard work and smart work. Without proper strategy or planning, whatever you do, the probability of success will always be low. The planning should be based upon the reality. It should be based on the ground level of situation. You need to find out the easiest way out of a particular problem. Hard work never bothers about that. But smart work can make a way to handle a difficult problem in an easier way.

If you can incorporate working hard and smart together, you will achieve great heights and lead yourself to a better future. One who works hard and smart will, in due course of time, procure all the benefits and have a golden future.

Questions :

(a) Explain why Bill Gates would rather choose a lazy person to do a difficult job.

25

(b) Enumerate the strategies of smart workers.

25

No.

91082

GENERAL STUDIES

Marks : 200

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **all** questions

1. Answer any *four* of the following questions in about 300 words each :

25×4=100

- (a) "Technological development is a great source of economic development but is also responsible for environmental degradation." Justify this statement.
- (b) Write a note on the historical perspective of population growth in India and its uneven distribution. Also discuss its impact on environmental degradation.
- (c) What is the meaning of deforestation? What are its effects? Why are they threatened? How can they be conserved?
- (d) Discuss global warming and mention its effects on the global climate. Explain the control measures to bring down the level of greenhouse gases which cause global warming in the light of the Kyoto Protocol, 1997.
- (e) The onset of the twentieth century marks a shift from middle class intelligentsia towards masses in the National Movement. Comment.
- (f) Discuss the significance of BRICS as a Non-Western Forum in reshaping global governance in the 21st century with special reference to India's perspective.

2. Answer any *four* of the following questions in not exceeding 200 words each :

10×4=40

- (a) Explain the problems and solution of Tourism Industry in Meghalaya.
- (b) What was the reason behind the Swadeshi Movement? Discuss the agitational methods adopted during the movement and its impact on the National Movement.
- (c) Discuss the factor giving rise to recurring internal security threats in North-East India.
- (d) What is the Fifth Schedule of the Indian Constitution? What are the issues and challenges pertaining to the schedule areas?
- (e) What is the difference between Act East Policy and Look East Policy? What are the initiatives to enhance connectivity under Act East Policy?
- (f) Discuss the envisaged goals and significance of National Education Policy, 2020.

3. Answer any *ten* of the following questions in not exceeding 100 words each :

5×10=50

- (a) What are the major challenges of public distribution system in India?
- (b) Discuss the role of the Vice President of India as the Chairman of the Rajya Sabha.
- (c) Explain population growth.
- (d) What is the role of seaport in the foreign trade of India?
- (e) What is GIS (Geographic Information System)? Discuss its various components.
- (f) What is quasi-judicial body? Explain with the help of concrete examples.
- (g) The Revolt of 1857 was a cumulative effect of the character and policies of the Colonial Rule in India. Comment.

- (h) The process of desertification does not have climate boundaries. Justify with example.
- (i) Covid-19 pandemic accelerated class inequality and boundaries in India. Comment.
- (j) Explain how e-technology helps farmers in production and marketing of agricultural produce.
- (k) Discuss several ways in which microorganism can help in meeting the current fuel shortage.
- (l) What is oil pollution? What are its impact on the marine ecosystem? In what way it is harmful for country like India?
- (m) Can the vicious cycle of gender inequality, poverty and malnutrition be broken through microfinancing of women SHGs? Explain with examples.
- (n) To what extent, in your view, the Parliament is able to ensure accountability of the executive in India?
- (o) "Pressure groups play a vital role in influencing public policy making in India." Explain how the business associations contribute to public policies.

4. I. Read the following passages and answer the items that follow. Your answer to these items should be based on the passage only : $2 \times 5 = 10$

Passage—I

The best universities like Harvard and MIT, despite having the luxury of having some truly excellent teachers on their payroll, are increasingly embracing the 'flipped classroom' format, where students listen to video lectures at home, and spend class time applying their knowledge, solving problems, discussing examples, etc., professors guide that discussion and fill in wherever necessary, explaining those bits that seem to be eluding the students and throwing in advanced ideas that happen to be topical. These universities have made their video lectures available free for anyone in the world. They are also encouraging colleges and universities all over the world to integrate these online courses into their own pedagogy, picking the pieces that are appropriate for their needs and building a package around them.

Which one of the following statements best reflects the central idea of the passage given above?

- (a) Efficacy of universities would be better in online mode of conducting classroom tuition as compared to conventional method.
- (b) Availability of higher education can be made easier and cheaper without diluting the content.
- (c) We need not invest much in infrastructure related to higher education and yet develop better human and social capital.
- (d) Private sector institutions in higher education as well as coaching institutes can take advantage of this opportunity and thrive well.

Passage—II

Our cities are extremely vulnerable to climate change because of large concentrations of populations and poor infrastructure. Moreover, population densities are increasing in them but we have not yet developed the systems to address climate change impacts. Our cities contribute to 65 percent of the GDP, but there are not enough facilities to cater to the needs of the people. It is important to address the issues of air quality, transport, etc., that are vital to identifying sustainable solutions. We need to involve citizens in city planning and create an ecosystem that meets the needs of people.

Which among the following is the most logical and rational inference that can be made from the passage given above?

- (a) Our cities need to have well-defined administrative setup with sufficient autonomy.
- (b) Ever increasing population densities is a hindrance in our efforts to achieve sustainable development.
- (c) To maintain and develop our cities we need to adopt sustainability-related interventions.
- (d) Public-Private partnership mode of development is the viable long-term solution for the infrastructure and sustainability problems of India.

II. In a rare coin collection, there is one gold coin for every three non-gold coins. 10 more gold coins are added to the collection and the ratio of gold coins to non-gold coins would be 1:2. Based on the information, what will be the total number of coins in the collection now?

III. If in a certain language, NATURE is coded as MASUQE, how is FAMINE coded in that code?

(a) FBMJND

(b) FZMHND

(c) GANIOE

(d) EALIME

(e) FZNJME

IV. Geeta is older than her cousin Meena. Meena's brother Bipin is older than Geeta. When Meena and Bipin visit Geeta, they like to play chess. Meena wins the game more often than Geeta.

Based on the above information, four conclusions, as given below, have been made. Which one of these logically follows from the information given above?

(a) Geeta hates to lose the game.

(b) Geeta is the oldest among the three.

(c) While playing chess with Geeta and Meena, Bipin often loses.

(d) Meena is the youngest of the three.

V. Select the missing numbers from the given alternatives :

8	32	4
7	?	5
2	6	3

Which of the numbers 30, 35, 20, 25 is the missing number in the above matrix?

No.

93037

ECONOMICS

Paper—I

Marks : 150

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—1

(Microeconomics)

Answer any *three* questions :

10×3=30

1. Critically discuss Samuelson's definition of economics. 10
2. (a) What is 'compensating variation' in income?
(b) Discuss Slutsky's decomposition of the price effect with an illustration. 2+8=10
3. Differentiate between the envelope curve in traditional cost theory and the L-shaped curve in modern cost theory. 10
4. What are the necessary conditions for price discrimination? Show how price discrimination increases the monopolist's profit. 2+8=10
5. Given the demand curve of the monopolist $X = 40 - 0.2P$ and cost function $C = 80 + 20X$, find the profit-maximizing price and quantity. Also check if the 2nd-order condition is satisfied. 8+2=10
6. Explain the marginal productivity theory of distribution. 10

UNIT—2

(Macroeconomics)

Answer any *three* questions :

10×3=30

7. Discuss the value-added approach for calculating national income. What are the difficulties in the calculation of national income? 6+4=10
8. Explain the concept of the multiplier. What leakages arise in the working of the multiplier? 5+5=10
9. What are the determinants of inducement to invest? What measures can be used to stimulate investment? 5+5=10
10. Explain the different phases of a business cycle with the help of a diagram. Discuss the use of monetary policy for economic stabilization. 5+5=10
11. Write notes on the following : 2×5=10
- (a) Hyperinflation
 - (b) Comprehensive inflation
 - (c) Sporadic inflation
 - (d) Scarcity inflation
 - (e) Structural inflation
12. What is deflation? Discuss its causes and effects. 2+8=10

UNIT—3

(Planning and Development, and Environmental Economics)

Answer any *three* questions ;

10×3=30

13. Is per capita real income a satisfactory index of economic development? Discuss. 10
14. What is human development index (HDI)? Discuss the indices used in HDI. Explain the construction of HDI. 2+3+5=10

15. Diagrammatically explain the path to development via (a) excess capacity and (b) shortage of SOC. 5+5=10
16. (a) What is the rationale for economic planning?
(b) What is micro-level planning? Discuss the significance and objectives of micro-level planning. 3+(2+5)=10
17. Discuss the role of ecology in economic development. 10
18. Explain the concept of sustainable development. Discuss the policies for sustainable development. 4+6=10

UNIT—4

(International Economics)

Answer any *three* questions : 10×3=30

19. Explain the gains from trade and their distribution under the comparative theory of international trade using an arithmetical illustration. 10
20. (a) Distinguish between balance of trade and balance of payments.
(b) Balance of payments is always in equilibrium. Explain. 4+6=10
21. Critically discuss the automatic price adjustment under flexible exchange rates. 10
22. Explain the functions of the IMF. Discuss the relevance of the IMF to India. 7+3=10
23. Briefly explain the working of the World Bank. How has it contributed to the development of India? 7+3=10
24. Distinguish between GATT and WTO. State the objectives of WTO. 5+5=10

UNIT—5

(Statistics)

Answer any *three* questions :

10×3=30

25. Define the following with examples :

2×5=10

- (a) Discrete frequency distribution
- (b) Class interval
- (c) Class boundary
- (d) Class size
- (e) Class mark

26. Discuss the merits and demerits of arithmetic mean. The table below shows the number of skilled and unskilled workers in two small communities together with their average hourly wages :

Worker category	Ram Nagar		Shyam Nagar	
	Number	Wage per hour (₹)	Number	Wage per hour (₹)
Skilled	150	180	350	175
Unskilled	850	130	650	125

Determine the average hourly wage for each community.

6+4=10

27. What are the characteristics of an ideal measure of dispersion? Write short notes on the following :

4+(3+3)=10

- (a) Range
- (b) Quartile deviation

28. Define correlation. Explain the different types of correlation with suitable examples. Calculate Spearman's rank correlation coefficient between advertisement cost and sales from the following data :

2+3+5=10

Advertisement cost ('000 ₹)	39	65	62	90	82	75	25	98	36	78
Sales (Lakhs ₹)	47	53	58	86	62	68	60	91	51	84

29. Why is Fisher's index number called an ideal index number? From the following data, construct Fisher's quantity index number : 2+8=10

Commodities	Base Year		Current Year	
	Price	Quantity	Expenditure/Value	Quantity
A	25	40	2000	50
B	22	18	1200	30
C	54	16	1320	44
D	20	40	1350	45
E	18	30	630	15

30. Determine the equation of a straight-line trend which best fits the following data and estimate the value for 2015 : 8+2=10

Year	2004	2005	2006	2007	2008
Sales	35	56	79	80	40

No.

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ECONOMICS

Paper—II

Marks : 150

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—1

(Public Finance, Money and Banking)

Answer any six questions :

10×6=60

1. Write a note on the components of tax and non-tax receipts of public authority.
2. Discuss the allocational, distributional and stabilizational effects of taxation.
3. Write short notes on the following methods of debt redemption : 2×5=10
 - (a) Repudiation
 - (b) Refunding
 - (c) Conversion
 - (d) Sinking fund method
 - (e) Capital levy
4. Discuss the effects of public expenditure on employment.
5. Differentiate between balanced and unbalanced budgets.
6. What is the Finance Commission? What are the major recommendations of the 15th Finance Commission? 3+7=10

7. What is deficit financing? Briefly explain the concepts of Revenue Deficit, Budgetary Deficit, Fiscal Deficit and Monetary Deficit. 2+8=10
8. Differentiate between money market and capital market giving key features and instruments employed in each.
9. Write short notes on the following : 5×2=10
- (a) IDBI
- (b) SIDBI
10. Has nationalization of banks in India improved the economy's financial efficiency?
11. Discuss, in detail, the functions of RBI.
12. Explain how monetary policy achieves its goal of maintaining price stability while in pursuance of economic growth.

UNIT—2

(Indian Economy)

Answer any six questions : 10×6=60

13. Give an overview of the Indian economy in the pre- and post-reform periods.
14. Discuss the trend of India's national income in the pre- and post-reform periods and sectoral contribution to national income. What are the contributing factors leading to slow growth? 6+4=10
15. Has India shown significant change in its occupational structure? Give reasons for your answer.
16. Deliberate on the functioning and the key achievements of the RPDS, 1992.
17. How has Make in India campaign propelled the Indian economy towards economic progress?

18. Discuss the present performance of the MSME sector in India and the role played by the MSME sector in India.
19. Discuss the direction of India's foreign trade in recent years.
20. Critically discuss the role of MNCs in the Indian economy.
21. Give a critical evaluation of Poverty Alleviation Programmes in India.
22. Discuss the objectives and features of the NITI Aayog.
23. Differentiate between rural unemployment and urban unemployment in India. Suggest some remedial measures to solve the unemployment problem in the country.
24. What are the causes of inflation in India? Suggest some remedial measures to the problem.

UNIT—3

(Economy of Meghalaya)

Answer any *three* questions :

10×3=30

25. Briefly discuss the sectoral contribution of Meghalaya to NSDP in recent years. What are the economic factors responsible for creating problems of economic development in the region? 4+6=10
26. Discuss the trend of sectoral outlays in Meghalaya in recent years.
27. What is the present economic classification of Meghalaya's population? Is there any cause for change? Justify your answer.
28. Describe the water resources of Meghalaya.
29. What are the causes of low rate of industrialization in Meghalaya?

* * *

No.

94021

MATHEMATICS

Paper—I

Marks : 150

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. (a) Let S be the set of all triangles in a plane. If $a, b \in S$, define $a \sim b$, if and only if, a and b are similar. Show that \sim is an equivalence relation on S . 5
- (b) Give an example of three non-empty sets A, B, C to show that $(A - B) \cap C = (A \cap C) - B^C$. 5
- (c) Let $f : X \rightarrow Y$ be a function and $A, B \subseteq X$. Prove that—
(i) if $A \subseteq B$, then $f(A) \subseteq f(B)$;
(ii) $A \subseteq f^{-1}f(A)$. 3+2=5
- (d) Solve the equation $x^4 - 3x^3 - 5x^2 + 9x - 2 = 0$, given that one of the roots is $(2 + \sqrt{3})$. 5
- (e) For any finite set A , prove that if a map $f : A \rightarrow A$ is one-one, then it is onto. 5
- (f) Using Cramer's rule, find the value of x, y, z satisfying the following : 5
- $$\begin{aligned}x + y - z &= 63 \\x - 2y + z &= -5 \\x + 3y - 2z &= 14\end{aligned}$$
- (g) Show that the function $f : Z \rightarrow Z$, defined by $f(x) = 4x^3 + 1$, is one-one but not onto. 5

(h) Define a binary operation on a non-empty set A . Determine whether the map $*$: $Q \times Q \rightarrow Q$, given by $*(a, b) = a * b = \frac{a-b}{2}$, is associative and commutative or not. 1+4=5

(i) For any positive integer n , let $G = \{x \in \mathbb{R} : x^n = 1\}$. Prove that G is a group under usual multiplication. 5

UNIT—II

2. (a) Using $(\epsilon-\delta)$ definition, show that $\lim_{x \rightarrow 0} (x \sin \frac{1}{x}) = 0$. 5

(b) A function $f(x)$ is defined as follows :

$$f(x) = \begin{cases} \frac{x^2}{a} - a, & \text{when } x < a \\ 0, & \text{when } x = a \\ a - \frac{a^2}{x}, & \text{when } x > a \end{cases}$$

Prove that the function is continuous at $x = a$ ($a \neq 0$). 5

(c) Show that the real-valued function $f(x) = |x+7|$ is differentiable everywhere except at $x = -7$. 4

(d) If

$$y = \sin (m \sin^{-1} x),$$

show that

$$(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (m^2-n^2)y_n = 0$$
 6

(e) Differentiate the following functions w.r.t. $\frac{x}{2}$: 2½+2½=5

(i) $y = \sin(\cos x)$

(ii) $y = e^{x^3-1}$

(f) Show that

$$\int_0^{\frac{\pi}{4}} \log (1 + \tan x) dx = \frac{\pi}{8} \log 2$$
 5

(g) Prove that the sequence $x_n = \frac{3n+1}{n+2}$ is monotonic increasing and bounded.

Also find $\lim_{n \rightarrow \infty} x_n$.

4+1=5

(h) State Leibnitz's theorem on alternating series. Deduce that the series

$\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2+3}$ is convergent.

5

(i) Show that

$$\int_0^{\frac{\pi}{2}} (a^2 \sin^2 x + b^2 \cos^2 x) dx = (a^2 + b^2) \frac{\pi}{4}$$

5

UNIT—III

3. (a) The least force which will move a weight up an inclined plane is P . Show that the magnitude of the least force, acting parallel to the plane, which will move the weight upwards is

$$P\sqrt{1+\mu^2}$$

μ being the coefficient of friction of the plane.

5

(b) A particle of mass m moves in a straight line, being repelled from a fixed point O with a force $m\mu x$, when its distance from O is x . If it starts from O with velocity V , show that the time taken for the velocity to be increased to $2V$ is

$$\frac{1}{\sqrt{\mu}} \sinh^{-1} \sqrt{3}$$

5

(c) Show that the centre of gravity of a triangular lamina is same as that of three equal particles placed at the vertices.

5

(d) Show that the centre of gravity of three rods forming a triangle is the in-centre of the triangle formed by joining their middle points.

5

(e) A uniform rod AB is suspended with its end in contact with a smooth vertical wall AC by a string CE ; if CB is horizontal, then show that

$$AE = \frac{1}{3} AB.$$

5

- (f) A particle of mass m is projected vertically under gravity, the resistance of the air being mk times the velocity. Show that the greatest height attained by the particle is $\frac{V^2}{g}[\lambda - \log(1 + \lambda)]$, where V is the terminal velocity of the particle and λV is its initial velocity. 5
- (g) The direction of motion of a projectile at a certain instant is inclined at an angle α to the horizontal; after t seconds it is inclined at an angle β . Prove that the horizontal component of the velocity is $\frac{gt}{\tan\alpha - \tan\beta}$. 5
- (h) A ball A of mass m_1 impinges directly on another ball B of mass m_2 , which is at rest. After the impact B impinges directly on a third ball C of mass m_3 , which is also at rest. If the velocity imparted to C is the same as A had at first and if all the balls are perfectly elastic, show that $(m_1 + m_2)(m_2 + m_3) = 4m_1m_2$. 5

UNIT—IV

4. Define the following terms (any two) : 2
- (a) Bit
- (b) Byte
- (c) Word
5. Convert the following numbers from the given base to the bases indicated (any two) : $3 \times 2 = 6$
- (a) $(1001001.011)_2 = (?)_{10}$
- (b) $(623.77)_8 = (?)_2$
- (c) $(2AC5.D)_{16} = (?)_{10}$
- (d) $(153.5)_{10} = (?)_8$
6. What are logic gates? Give the truth table of AND and XOR gates. $2+2=4$
7. Formulate an algorithm that determines whether a specified number is a prime. Draw a flowchart for the same. $3+3=6$
8. What are different types of memory in a computer system? 2

MATHEMATICS

Paper—II

Marks : 150

Time : 3 hours

*The figures in the margin indicate full marks for the questions***UNIT—I**

1. Reduce the equation

$$17x^2 + 12xy + 8y^2 - 46x - 28y + 17 = 0 \text{ to the standard form.} \quad 5$$

2. If
- $r = |\bar{r}|$
- , where
- $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$
- , then show that
- $\text{grad}(r^2) = 2\bar{r}$
- .
- 5

3. Find the centre of the conic given by the equation

$$3x^2 - 8xy + 7y^2 - 4x + 2y - 7 = 0 \quad 5$$

4. Prove that the line

$$\frac{x-2}{4} = \frac{y+1}{3} = \frac{z-3}{5}$$

and the line of intersection of the two planes $x + 2y + 3z - 9 = 0 = 2x - y + 2z - 11$ are coplanar. 5

5. Find the equation of a cone whose vertex is
- (α, β, γ)
- and base
- $y^2 = 4ax, z = 0$
- .
- 5

6. If
- $u = x + y + z, v = x^2 + y^2 + z^2, w = xy + yz + zx$
- , then prove that

$$(\text{grad } u) \cdot [(\text{grad } v) \times (\text{grad } w)] = 0 \quad 5$$

UNIT—II

7. (a) Obtain the differential equation of all circles passing through the origin and their centres lying on the X-axis. 3

(b) Solve the equation

$$(1+x^2)\frac{dy}{dx} - xy = 1 \quad 2$$

8. Find the general and singular solutions of the equation $y = px + ap(1-p)$, where p stands for $\frac{dy}{dx}$. 5

9. Solve the exact equation $(x^3 - 3x^2y + 2xy^2)dx - (x^3 - 2x^2y + y^3)dy = 0$, given that $y = 1$ when $x = 1$. 5

10. Find the orthogonal trajectories of the curve $x^2 + y^2 + 2gx + c = 0$, where g is a parameter. 5

11. Solve the equation

$$x\frac{dy}{dx} + y\log y = xye^x \quad 5$$

UNIT—III

12. The ABC Electric Appliance Company produces two products, refrigerators and ranges. Production takes place in two separate departments. Refrigerators are produced in dept-I and ranges are produced in dept-II. The company's two products are produced and sold on a weekly basis. The weekly production cannot exceed 25 refrigerators in dept-I and 35 ranges in dept-II, because of limited available facilities in the two depts. The company regularly employs a total of 60 workers in the two depts. A refrigerator requires 2 man-weeks of labour, while a range requires 1 man-week of labour. A refrigerator contributes a profit of ₹ 60 and a range contributes a profit of ₹ 40.

Formulate the problem as L. P. problem. How many units of refrigerators and ranges should the company produce to realise a maximum profit? 5

13. Minimize the function Z as given below using simplex method :

7

$$Z = 12x + 20y + 18z$$

subject to

$$6x + 4y + 8z \geq 100$$

$$7x + 12y + 3z \geq 120$$

$$4x + 3y + 5z \geq 80$$

$$x, y, z \geq 0$$

14. Solve the following transportation problem :

8

Source	Destinations				Available
	1	2	3	4	
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
Requirements	6	10	12	15	43

UNIT—IV

15. Use Newton's forward difference formula of interpolation to find $f'(x)$ at $x = 1$ from the given data :

6

x	1	1.05	1.10	1.15	1.20	1.25	1.30
$f(x) = \sqrt{x}$	1	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017

16. Evaluate $\int_1^2 4e^{-x} dx$ using Simpson's 1/3rd rule.

6

17. Explain the method and merits of the construction of Price Index Number using the 'Unweighted Index Numbers' formulae.

5

18. From the following data, construct the cost of living index number :

4

Group	Price Relative	Weight
Food	250	45
Rent	150	15
Clothing	320	20
Fuel and Lighting	190	5
Misc.	300	15

19. From the following table, Find the three yearly weighted moving averages taking 1, 2, 3 as weights :

4

Year	1	2	3	4	5	6	7
Sales (in Lakhs)	1	2	3	4	5	6	7

UNIT—V

20. Explain the following terms with rough sketches :

3×3=9

(a) Histogram

(b) Frequency Polygon

(c) Ogive

21. Explain what is meant by Measure of Location. What are the characteristics of an ideal measure of location? Explain the different measures of location. Which is the best measure of location? Give reasons.

4+2+5+5=16

UNIT—VI

22. Define the following terms with examples :

2×5=10

(a) Exhaustive events

(b) Favourable events

(c) Mutually exclusive events

(d) Equally likely events

(e) Independent events

23. Show that the necessary and sufficient condition for the independence of n events A_1, A_2, \dots, A_n is that the probability of their simultaneous happening is equal to the product of their respective probabilities.

4

24. Prove that if B_1, B_2, \dots, B_n are mutually disjoint events with $P(B_i) \neq 0$ ($i = 1, 2, \dots, n$), then for any event A which is a subset of $B_1 \cup B_2 \cup \dots \cup B_n$ such that $P(A) > 0$, we have

$$P(B_i|A) = \frac{P(B_i)P(A|B_i)}{\sum_{i=1}^n P(B_i)P(A|B_i)} \quad 7$$

25. Among the students in a college, 60% of the students reside in the hostel and 40% of the students are day scholars. Previous year result reports that 30% of all students who stay in the hostel scored A Grade and 20% of day scholars scored A grade. At the end of the year, one student is chosen at random and found that he/she has an A grade. What is the probability that the student is a hosteller? 4

No.

92007

COMMERCE

Paper—I

Marks : 150

Time : 3 hours

The figures in the margin indicate full marks for the questions

All the questions are compulsory

1. Fill in the blanks :

1×20=20

- (a) The _____ Concept assumes that the business will continue for a long time to come.
- (b) Recording two aspects of each transaction is known as the _____ system.
- (c) _____ are assets that are purchased for permanent use in the business.
- (d) A statement prepared to check the arithmetical accuracy of ledger is known as _____.
- (e) The debit and credit columns of the Trial Balance should always be _____.
- (f) The excess of assets over liabilities is _____.
- (g) The obligations of the business to creditors are called _____.
- (h) Sales returns are also known as _____.
- (i) If any entry is made on the debit side and the same entry is recorded on the credit side of the Cashbook, it is called as _____.
- (j) The point at which total revenue is equal to total cost is called _____.

- (k) A Receipts and Payments Account is simply a summary of the _____.
- (l) When a transaction is entered partially or incorrectly in the Books of Accounts, it becomes an error of _____.
- (m) _____ expenses are those expenses which are paid in advance.
- (n) _____ is an income related to the current period but not received in cash.
- (o) Salaries Account is a _____ Account.
- (p) Current ratio is also known as _____.
- (q) When BE point is ₹ 20,000 and margin of safety is 20%, actual sales are _____.
- (r) Fixed cost per unit increases when level of activity _____.
- (s) _____ ratio is the most popular solvency ratio.
- (t) The angle formed by the sales line and total cost line at break-even point is known as _____.

2. Answer any six of the following questions in 4 or 5 sentences each : $5 \times 6 = 30$

- (a) State the causes of difference between balance shown by the Passbook and the balance shown by the Cashbook.
- (b) What are the objectives of preparing a Trial Balance?
- (c) What do you understand by Deferred Revenue Expenditure? Give examples.
- (d) Highlight the purposes of ratio analysis.
- (e) Differentiate between Balance Sheet and Fund Flow Statement.
- (f) Discuss briefly the major classifications of cash flows.
- (g) Differentiate between fixed budget and flexible budget.
- (h) What is P/V ratio? Explain its uses.
- (i) What are the essential principles of a good costing system?
- (j) Explain the concept of payback period.

3. Prepare a hypothetical Journal, Ledger and Trial Balance for a small business.

5×3=15

Or

What is meant by Accounting Standards? Explain their objectives and highlight their limitations.

5+5+5=15

4. From the following balances and information, prepare Trading and Profit & Loss Account of Mr. Balram for the year ended 31-03-2020 and a Balance Sheet as on that date :

30

Particulars	Dr. (₹)	Cr. (₹)
Mr. Balram's Capital Account	—	10,000
Plant and Machinery	3,600	—
Depreciation on Plant	400	—
Repairs to Plant	520	—
Wages	5,400	—
Salaries	2,100	—
Income-tax of Mr. Balram	100	—
Cash in Hand and at Bank	400	—
Land and Building	14,900	—
Depreciation on Building	500	—
Purchases	25,000	—
Purchases Return	—	300
Sales	—	49,800
Bank Overdraft	—	760
Accrued Income	300	—
Salaries Outstanding	—	400
Bills Receivable	3,000	—
Provision for Bad Debts	—	1,000
Bills Payable	—	1,600
Bad Debts	200	—
Discount on Purchases	—	708
Debtors	7,000	—
Creditors	—	6,252
Opening Stock	7,400	—
Total	70,820	70,820

Additional information :

(i) Stock on 31-03-2020 was ₹ 6,000

(ii) Write off further ₹ 600 for Bad Debts and maintain a Provision for Bad Debts @ 5% on Debtors

- (iii) Goods costing ₹ 1,000 were sent to customer for ₹ 1,200 on 30-03-2020 on sale or return basis. This was recorded as actual sales
- (iv) ₹ 240 paid as rent of the office was debited to Landlord Account and was included in Debtors
- (v) General Manager is to be given a commission @ 10% of Net Profit after charging such commission

Or

The following is the Receipts and Payments Account of Playmakers Club for the year ending 31-03-2018 :

<i>Receipts</i>	₹	<i>Payments</i>	₹
To Balance b/d	2,050	By Salaries	4,160
» Subscriptions		» Rates and Taxes	1,200
2016-17 80		» Stationery	800
2017-18 4,220		» Telephone	200
2018-19 <u>160</u>	4,460	» Investment in	
» Profit on Sports		Government Securities	2,500
Meeting	2,850	» Sundry Expenses	1,850
» Interest on Investment	2,000	» Balance c/d	900
» Sundry Receipts	250		
	<u>11,610</u>		<u>11,610</u>

The following additional facts are ascertained :

- (i) Stock of Stationery on April 1, 2017, was ₹ 100 and as on March 31, 2018, ₹ 180
- (ii) Rates and Taxes were prepaid to the extent of ₹ 400
- (iii) Telephone charges outstanding amounts to ₹ 75
- (iv) In 2016-17, Subscription Received in advance amounting to ₹ 200 for current year and ₹ 180 were due on March 31, 2018 for 2017-18
- (v) On March 31, 2017, Building stood in the books at ₹ 20,000 and it is required to write-off depreciation @ 5%. Investments at March 31, 2017 were ₹ 40,000

You are required to prepare Income and Expenditure Account for the year ended March 31, 2018 and a Balance Sheet as on that date.

30

5. The following is the Profit & Loss Account and Balance Sheet of PK Ltd. for the year ended 31 March, 2015 :

Profit and Loss Account of PK Ltd. for the year ended 31 March, 2015

Particulars	₹	Particulars	₹
To Opening Stock	90,000	By Sales	9,00,000
» Purchases	5,60,000	» Closing Stock	90,000
» Wages	2,14,000		
» Gross Profit	1,26,000		
	9,90,000		9,90,000
To Salaries	16,000	By Gross Profit	1,26,000
» Electricity	10,000		
» Misc. Expenses	10,000		
» Depreciation	30,000		
» Net Profit	60,000		
	1,26,000		1,26,000

Balance Sheet of PK Ltd. as on 31 March, 2015

Liabilities	₹	Assets	₹
Equity Share Capital	1,80,000	Fixed Assets 5,40,000	
Reserves and Surplus	1,20,000	(-) Depreciation <u>1,50,000</u>	3,90,000
Secured Loans	2,10,000	Stock	90,000
Creditors	90,000	Debtors	1,05,000
		Cash	15,000
	6,00,000		6,00,000

Discuss under the following important functional grouping, the usual ratios and comment on the financial strength and weakness :

20

- (a) Liquidity ratios :
- Current ratio
 - Liquid ratio
- (b) Solvency ratios :
- Debt-Equity ratio
 - Proprietary ratio
- (c) Profitability ratios :
- Gross Profit ratio
 - Net Profit ratio
 - Return on Capital Employed

Or

The following Balance Sheets are given :

<i>Liabilities</i>	2021 (₹)	2022 (₹)	<i>Assets</i>	2021 (₹)	2022 (₹)
Equity Share Capital	3,00,000	4,00,000	Goodwill	1,15,000	90,000
Redeemable Preference Capital	1,50,000	1,00,000	Land and Building	2,00,000	1,70,000
General Reserve	40,000	70,000	Plant	80,000	2,00,000
Profit and Loss Account	30,000	48,000	Debtors	1,60,000	2,00,000
Proposed Dividend	42,000	50,000	Stock	77,000	1,09,000
Creditors	55,000	83,000	Bills Receivable	20,000	30,000
Bills Payable	20,000	16,000	Cash in Hand	15,000	10,000
Provision for Taxation	40,000	50,000	Cash at Bank	10,000	8,000
	6,77,000	8,17,000		6,77,000	8,17,000

It is also given that—

- (i) Depreciation of ₹ 20,000 on Land and Building and ₹ 10,000 on Plant have been charged in 2022;
- (ii) Interim Dividend of ₹ 20,000 has been paid in 2022;
- (iii) Income-tax of ₹ 35,000 has been paid during 2022.

Prepare Cash Flow Statement for the year 2022.

20

6. Draw up a flexible budget for overhead expenses on the basis of the following data and determine the overhead rates @ 70%, 80% and 90% plant capacity :

20

<i>Particulars</i>	<i>At 80% capacity</i>
	₹
Variable overheads :	
Indirect labour	12,000
Stores including spares	4,000
Semi-variable overheads :	
Power (30% fixed, 70% variable)	20,000
Repairs and maintenance (60% fixed, 40% variable)	2,000
Fixed overheads :	
Depreciation	11,000
Insurance	3,000
Salaries	10,000
<i>Total overheads</i>	62,000
Estimated direct labour hours	124000 hrs

Or

What is Capital budgeting? What are the various methods of ranking investment proposals? Highlight the best method for evaluating capital expenditure citing relevant reasons.

5+5+10=20

7. Usha Engineering Works Ltd. manufactured and sold 1000 sewing machines in 2020. Following are the particulars obtained from the records of the company :

Particulars	₹
Cost of materials	80,000
Wages paid	1,20,000
Manufacturing expenses	50,000
Salaries of managerial staff	60,000
Rent, rates and insurance	10,000
Selling expenses	30,000
General expenses	20,000
Sales	4,00,000

The company plans to manufacture 1200 sewing machines in 2021. You are required to submit a statement showing the price at which the machines would be sold so as to show a profit of 10% on the selling price. The following additional information is supplied to you :

15

- (i) Price of materials will rise by 20% over the previous year's level.
- (ii) Wage rates will rise by 5%.
- (iii) Manufacturing expenses per unit will rise in proportion to the combined cost of materials and wages.
- (iv) Selling expenses per unit remain unchanged.
- (v) Other expenses will remain unaffected by the rise in output.

Or

Company A and Company B, both under the same management, make and sell the same type of product. Their budgeted Profit and Loss Accounts for June are as under :

	Company A		Company B	
	₹	₹	₹	₹
Sales		3,00,000		3,00,000
Less : Variable Cost	2,40,000		2,00,000	
Fixed Cost	30,000	2,70,000	70,000	2,70,000
Profit		30,000		30,000

You are required to—

- calculate the break-even point for each;
- calculate the sales volume at which each of the two companies will make a profit of ₹ 10,000;
- assess how their profitability will change with increase or decrease in sales volume.

15

No.

95006

COMMERCE

Paper—II

Marks : 150

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer the following questions :

25×3=75

1. (a) "Planning is a mere ritual in a fast-changing environment." Do you agree with the statement? Substantiate citing relevant reasons. 5+15=20
- (b) Elucidate the role of rational decision making in effective planning. 5

Or

What do you understand by MBO? Highlight the important elements of MBO while specifying its relevance in modern-day organizations. 5+10+10=25

2. (a) "Informal organizations are as important as formal organizations." Justify. 10
- (b) How do you motivate a diverse workforce with varying cultural backgrounds and personal motivations? Explain citing relevant theoretical foundations. 5+10=15

Or

What is network organization structure? Explain the relative functional merits and demerits of network organization structure vis-à-vis classical organizational formats. 5+10+10=25

3. (a) "Control presupposes planning." In the light of the statement, elucidate the process of control. 5+5=10
- (b) Explain the process of organizational change. Highlight the important causes for resistance to change. 5+10=15

Or

Distinguish between PERT and CPM. Explain the advantages of applying them in contemporary organizations. 10+15=25

SECTION—B

Answer the following questions : 25×3=75

4. (a) Define statistics and discuss its scope and limitations. 10
- (b) Compute mean, median and mode from the following data : 15

Marks	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45
No. of Students	7	10	16	30	24	17	10	5	1

Or

- (a) Compute quartile deviation and its coefficient from the following data : 10

<i>X</i>	10-20	20-30	30-40	40-50	50-60	60-70
<i>f</i>	12	19	5	10	9	6

- (b) Find the standard deviation and its coefficient from the following table : 15

Age	20-25	25-30	30-35	35-40	40-45	45-50
No. of Persons	170	110	80	45	40	35

5. (a) Briefly explain the components of a time series. 10
- (b) From the following data, derive trend values by the method of least squares and also estimate the production for the year 2017 : 15

Year	2010	2011	2012	2013	2014	2015	2016
Production ('000 quintals)	80	90	92	83	94	99	92

Or

(a) What is index number? What are their uses? 10

(b) Calculate (i) Paasche's, (ii) Laspeyre's and (iii) Fisher's price index from the following data : 15

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	12	20	15	25
B	10	8	16	10
C	15	2	12	1
D	60	1	65	1
E	3	2	10	1

6. (a) Calculate Pearson's coefficient of correlation from the following data : 15

X	28	41	40	38	35	33	40	32	36	33
Y	23	34	33	34	30	26	28	31	36	38

(b) Find the rank correlation coefficient from the following distribution : 10

X	48	60	72	62	56	40	39	52	30
Y	62	78	65	70	38	54	60	32	31

Or

(a) What is meant by interpolation? What are the assumptions on which the method of interpolation is based? 10

(b) Interpolate the missing figures from the following table with the help of a suitable formula : 15

Year	2009	2010	2011	2012	2013	2014	2015
Production	200	220	260	?	350	?	430
