II PUC MODEL QUESTION PAPER - 1

(FOR THE YEAR 2020-21)

Time : 3 Hours 15 Minutes **Sub.: Basic Mathematics (Code:75)** **Max. Marks: 100**

Instructions:

(i) The question paper has 5 parts A, B, C, D and E. Answer all the parts.

(ii) Part-A carries 10 marks, Part-B carries 20 marks, Part-C carries 30 marks, Part-D carries 30 marks and Part-E carries 10 marks.

(iii) Write the question number properly as indicated in the question paper.

PART –A

I. Answer ALL the questions. **10 × 1 = 10**

1. Find 'x' such that $\begin{bmatrix} 8 & x \\ 4 & 7 \end{bmatrix}$ is symmetric.

2. In how many ways can 5 people stand in a queue.

3. If $P(A) = \frac{3}{5}$. Find P(A').

4. Symbolise "If oxygen is a gas then gold is a compound".

5. Find the 3rd proportional to 3, 12.

6. Define Banker's Gain.

7. What is market value of 12% stock when an investment of ₹720.

8. Write the formula for learning index.

9. Find the value of cos 15°.

10. Find equation of the circle with centre (–2, –1) and the radius is 2.

PART –B

II. Answer any TEN questions. **10 × 2 = 20**

11. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} -3 & 4 \\ 2 & -1 \end{bmatrix}$. Find $3A - 2B - 4C$.

12. Prove that "If any 2 rows (or columns) of a determinant are interchanged then the value of the determinant changes only in sign."

13. Find the number of ways in which 8 men be arranged round a table so that 2 particular men may not be next to each other.

14. Find the number of straight lines and triangles that can be formed out of 20 points in which 8 are collinear.

15. Two dice are rolled simultaneously. What is the probability of getting a doublet of even numbers.

16. If the compound proposition $p \rightarrow (\sim q \vee r)$ is false, then find the truth value of p, q and r.

17. Find the ratio between two numbers such that their sum is 40 and their difference is 8.

18. TD on a bill was ₹100 and BG was ₹10. What is the face value of the bill?

19. How much of 8% stock at 96 can be purchased for ₹4,800? Also find the income obtained.

20. Gopal purchased a scooter costing ₹32,450. If the rate of sales tax is 9%. Calculate the total amount payable by him?

21. A ladder leaning against a wall makes an angle of 60° with the ground, the foot of the ladder is 36m away from the wall. Find the length of the ladder.

22. If $\sin\theta = \frac{3}{5}$ and θ is acute, find value of $\sin 3\theta$.

23. If $\tan A = \frac{1}{3}$, $\tan(A + B) = \frac{1}{7}$. Find tan B.

24. Show that the line $4x - y = 17$ passes through the centre of circle $x^2 + y^2 + - 8x + 2y = 0$.

PART –C

III. Answer any TEN questions. **3 × 10 = 30**

25. If $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, prove that $A^2 - 4A + 5I = O$, [where O = null matrix of order 3 × 3].

26. Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$.

27. Find the number of permutations of the letters of the word MISSISSIPPI. In how many of these

(i) the 4S's are together. (ii) begin with MISS.

(iii) the 4S's are not together.

28. Three fair coins are tossed simultaneously. Find the probability of

(i) getting one head. (ii) getting atleast 2 heads.

29. A card is drawn from a pack of 52 playing card. What is the probability that the card is king given that the card is red?

30. Find the middle term in the expansion of $\left(3x - \frac{x^3}{6}\right)^8$.

31. Resolve into partial fractions $\frac{x+1}{(x-2)(x-3)}$.

32. Write the converse, inverse and contrapositive of "If x is less than one then it is a prime number."

33. If the monthly incomes of A and B are in the ratio 3:4 and their expenditure are in the ratio 1:2. If each saves ₹2,000. Find their monthly incomes.

34. If ₹120 maintain a family of 4 persons for 30 days. How long ₹300 maintain a family of 6 persons?

35. A man invests equal sums of money in 4%, 5% and 6% stock, each stock being at par. If the total income of the man is ₹3,600. Find his total investment.

36. Mohan, a owner of a departmental store purchased an article of ₹1,500 at 4% VAT and sell it at ₹1,700 to the customer at 4% VAT. How much amount did the shopkeeper deposit to the government as VAT.

37. Prove that $\cos A + \cos(120 + A) + \cos(120 - A) = 0$.

38. Find the value of K for which the line $x + Ky - 5 = 0$ may touch the circle $x^2 + y^2 - 2x - 6x - 6 = 0$.

PART –D

IV. Answer any SIX questions. **6 × 5 = 30**

39. A committee of 5 are to be formed from 8 Americans and 5 Anglo Indians. In how many ways can this be done when the committee contains

(i) exactly 2 Anglo-Indians (ii) atleast two Anglo-Indians

40. Find the coefficient of x^{18} in $\left(x^2 - \frac{6}{x}\right)^{15}$.

41. Resolve into partial fractions $\frac{3x+2}{(x-2)(x+3)^2}$.

42. Check whether $\sim (p \leftrightarrow q)$ and $(p \wedge \sim q) \vee (q \wedge \sim q)$ are logically equivalent.

43. If two men and four women can do a work in 33 days and 3 men and 5 women can do the same work in 24 days. How long shall 5 men and 2 women take to do the same work?

44. A bill of ₹1,460 was drawn on 1st April for 6 months after date and was discounted at 5% p.a for ₹1,451. On what date was the Bin discunted.

45. A company requires 100 hours to produce the first 10 units at ₹15 per hour. The learning curve effect is 80%. Find the total labour cost to produce a total of 160 units.

46. Maximize $Z = 10500x + 9000y$

Subject to $x + y \leq 50$

$2x + y \leq 80$ $(x \geq 0, y \geq 0)$

47. The angles of elevation of the top of a tower from the base and the top of a building are 60° and 30°. The building is 20 metres high. Find the height of the tower.

48. Prove that $\frac{\sin 2A + \sin 5A - \sin A}{\cos 2A + \cos 5A + \cos A} = \tan 2A$.

PART –E

V. Answer any ONE question. **1 × 10 = 10**

49. (a) Solve the system of equations by matrix method (6)

$3x - y + 2z = 13$

$2x + y - z = 3$

$x + 3y - 5z = -8$

(b) Find the value of $(1.02)^6$ using binomial theorem upto 4 places of decimals. (4)

50. (a) Show that the points (2, –4) (3, –1) (3, –3) (0, 0) are concyclic. (6)

(b) Rahul has 50 and 85 units of labour and capital respectively which he can use to produce two types of goods A and B. To produce one unit of A, 1 unit of labour and 2 units of capital are required. Similarly 3 units of labour and 2 units of capital is required to produce 1 unit of B. If A and B are priced at ₹100 and ₹150 per unit respectively, how should the producer use his resources to maximize the total revenue. Formulate the LPP to maximize his total revenue.

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II PUC MODEL QUESTION PAPER - 2

(FOR THE YEAR 2020-21)

Time : 3 Hours 15 Minutes **Sub.: Basic Mathematics (Code:75)** **Max. Marks: 100**

Instructions:

(i) The question paper has 5 parts A, B, C, D and E. Answer all the parts.

(ii) Part-A carries 10 marks, Part-B carries 20 marks, Part-C carries 30 marks, Part-D carries 30 marks and Part-E carries 10 marks.

(iii) Write the question number properly as indicated in the question paper.

PART –A

I. Answer ALL the questions. **10 × 1 = 10**

1. Evaluate $\begin{vmatrix} 441 & 442 & 443 \\ 445 & 446 & 447 \\ 449 & 450 & 451 \end{vmatrix}$

2. Find the total number of ways in which 8 different colored beads can be strung together to form a necklace.

3. What is the probability of getting a multiple of 3 when a die is thrown?

4. Write the verbal form of the compound proposition

if p: 3 is a real number $(p \leftrightarrow q) \wedge r$

q: Mathematics is easy

r :$\sqrt{2}$ is irrational

5. Find the sub triplicate ratio of 125:64.

6. For ₹512.50 due 6 months at 15% p.a, find the discounted value of the bill.

7. 10% stock is quoted at ₹120. Find the rate of interest.

8. Define index of learning.

9. Find the value of $3\sin 10° - 4\sin^3 10°$.

10. Find the equation of the point circle with centre at (4,–5).

PART –B

II. Answer any TEN questions. **10 × 2 = 20**

11. Find x and y given that $\begin{bmatrix} x+y & 3 \\ -1 & x-y \end{bmatrix} = \begin{bmatrix} 4 & 3 \\ -1 & 8 \end{bmatrix}$

12. If $A = \begin{bmatrix} 1 & 3 \\ 1 & 0 \end{bmatrix}$.. Prove that $A^2 - A - 3I = 0$ (I = Identity Matrix of 2 × 2).

13. A family of 4 brothers and 3 sisters is to be arranged for a photograph in one row. In how many ways they can be seated if no two sisters are together?

14. If ${}^nC_8 = {}^nC_{12}$ find ${}^nC_5$.

15. The probability of occurrence of two events A and B are $\frac{1}{4}$ and $\frac{1}{2}$ respectively. The probability of their simultaneous occurrence is $\frac{7}{50}$. What is the probability that neither A nor B occurs?

16. If p,q,r are propositions with truth values F,T and F respectively, then find the truth value of $(\sim p \rightarrow q) \vee r$.

17. Two numbers are in the ratio 3:5. If 5 is added to each, they are in the ratio 22:35. Find the numbers.

18. A bill of ₹5000 drawn on 10-4-1998 at 3 months was discounted on 1-5-1998 at 12% p.a. Find the bankers discount.

19. What income can be obtained from an investment of ₹10,725 in 6.5% stock at 143. What is the amount of stock purchased?

20. A shopkeeper purchased an electric iron of ₹1000 at 8% VAT from the whole seller and sell it to the customer of ₹1400 at 8% VAT.

Find i) amount paid by the customer

ii) the VAT to be paid by the shopkeeper

21. A ladder leaning against a wall makes an angle of 60° with the ground, the foot of the ladder 36m away from the wall. Find the length of the ladder.

22. If $\tan(A - B) = \frac{1}{7}$, $\tan A = \frac{1}{2}$. Show that $A + B = 45°$.

23. Prove that $\frac{1+\sin 2\theta}{\cos 2\theta} = \frac{1+\tan\theta}{1-\tan\theta}$.

24. Find the equation of the circle concentric with circle $x^2 + y^2 - 6x - 2y + 4 = 0$

PART –C

III. Answer any TEN questions. **10 × 3 = 30**

25. Find A and B if $2A+B = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 4 & 0 \end{bmatrix}$, $3A + B = \begin{bmatrix} 4 & 6 & 1 \\ 2 & 3 & 5 \end{bmatrix}$.

26. Solve for x: $\begin{vmatrix} 1 & -2 & x+3 \\ 1 & x-2 & 3 \\ x+1 & -2 & 3 \end{vmatrix} = 0.$

27. Find the number of permutations of the letters of the word UNIQUE

(a) How many of them end with QUE

(b) How many begin with U and end with E

(c) In how many all vowels are together

28. A bag contains 6 red, 4 white and 2 black balls. 2 balls are drawn at random. What is the probability that balls drawn are

(a) both red (b) 1 white and 1 black (c) same color

29. There are 20 girls and 60 boys in a class. Half of the girls and half of the boys are first class students. A student is selected at random. What is the probability that the student is either a boy or a first class holder?

30. Find the middle term in the expansion of $\left(3x-\frac{x^3}{6}\right)^8$.

31. Resolve $\frac{x+8}{(x-1)(2x+1)}$ into partial fraction

32. Write converse, inverse and contrapositive of

"If the weather is fine then my friends are coming for a movie"

33. An article is sold at 40% gain at the cost price. Find the ratio of the selling price and cost price.

34. Four numbers formed by adding 1,5, 10 and 15 to a certain number are in proportion. Find the number.

35. Sahana invests ₹3240 in a stock at 108 and sells when the price falls to 104. How much stock at 130 can Sahana now buy?

36. If the rate of sales tax is 5% Sangeetha has to pay ₹7,140 for the steel cupboard. What amount she has to pay if the sales tax is increased by 2%?

37. Prove that $\sin(A + B)\sin(A - B) = \cos^2 B - \cos^2 A$.

38. Find the length of the chord intercepted by the circle

$x^2 + y^2 + 4x + 6y - 12 = 0$.

PART –D

IV. Answer any six questions. **6 × 5 = 30**

39. A man has 10 relatives, 4 of them all ladies, 3 gentlemen and 3 children. In how many ways can he invite 7 relatives to dinner party so that

i) there are exactly 2 ladies, 3 gentlemen and 2 children

ii) there are exactly 2 gentlemen and atleast 3 ladies

iii) there are exactly 3 children, atleast 1 lady and atleast 2 gentlemen.

40. Find the term independent of x in $\left(3x-\frac{2}{x^2}\right)^{15}$.

41. Resolve $\frac{x}{(1+2x)^2(1-3x)}$ into partial fractions

42. Verify the proposition is logically equivalent or not $p \leftrightarrow q$ and $(\sim p \vee q) \wedge (\sim q \vee p)$

43. If 10 men or 20 boys can do a piece of work in 30 days, how long will 30 boys and 5 men took to do the same work?

44. A bill for ₹2920 drawn at 6 months was discounted on 10-4-97 for ₹2916. If the discounted rate is 15% p.a. On what date was the bill drawn?

45. An aircraft manufacturer supplies aircraft engines to different airlines. They have just completed an initial order for 30 engines involving a total of 6000 direct labor hours at ₹20 per hour. They have been asked to bid for a prospective contract for a supply of 90 engines. It is expected that there will be 80% learning effect. Estimate the labour cost for the new order.

46. Solve the L.P.P using graphical method

$Z_{max} = 2x + 3y$ (maximize)

Subject to the constraints

$x + y \leq 400$

$2x + y \leq 600$

$x, y \geq 0$

47. An airplane when flying at height of 2000m passes vertically above another plane at an instant when their angles of elevation from the same point of observation are 60° and 45° respectively. Find the distance between the airplanes.

48. Prove that $\frac{\sin 5A + \sin 4A + \sin 2A + \sin A}{\cos 5A + \cos 4A + \cos 2A + \cos A} = \tan 3A$.

PART –E

V. Answer any ONE question. **1 × 10 = 10**

49. (a) Solve by matrix method (6M)

$x - y - 2z = 3$

$2x + y + z = 5$

$4x - y - 2z = 1$

(b) Use binomial theorem to evaluate upto 4 decimal places for $(0.98)^4$. (4M)

50. (a) Show that points are concyclic (0,0), (1,1),(5,−5),(6,−4). (6M)

(b) Varun consumes two types of food A and B 8 units of proteins,12 units carbohydrates and 9 units of fat which is his daily requirements. 1 kg of food A contains 2,6, 1 units of protein, carbohydrates and fat respectively. 1 kg of food B contains 1, 1,3 units of protein, carbohydrates and fat respectively. Food A cost ₹8 per kg and food B contains ₹5 per kg. Formulate. an LPP to find how many kg of each food should he buy to minimize his cost of food. (4M)

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II PUC MODEL QUESTION PAPER - 3

(FOR THE YEAR 2020-21)

Time : 3 Hours 15 Minutes **Sub.: Basic Mathematics (Code:75)** **Max. Marks: 100**

Instructions:

(i) The question paper has 5 parts A, B, C, D and E. Answer all the parts.

(ii) Part-A carries 10 marks, Part-B carries 20 marks, Part-C carries 30 marks, Part-D carries 30 marks and Part-E carries 10 marks.

(iii) Write the question number properly as indicated in the question paper.

PART –A

I. Answer ALL the questions. **10 × 1 = 10**

1. If $A = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$, find 3A

2. In how many ways 10 people be seated round a table?

3. If $P(A) = \frac{3}{5}$, find P(A').

4. Negate : "If he is rich then he is happy".

5. Find the duplicate ration of 5 : 4.

6. Define Banker's gain.

7. How much stock at ₹75 can be bought for ₹3375.

8. Write the formula for learning Index.

9. If $\sin A = \frac{1}{2}$, find cos 2A.

10. Find the length of the chord of the circle $x^2 + y^2 - 6x + 4y + 5 = 0$ intercepted by x - axis.

PART –B

II. Answer any TEN questions. **10 × 2 = 20**

11. If $A = \begin{bmatrix} 1 & 3 \\ 1 & 0 \end{bmatrix}$, prove that $A^2 - A - 3I = 0$ (I = Identity matrix of 2 × 2).

12. Find the matrix A, if $2A + B = \begin{bmatrix} 2 & 0 \\ 1 & -3 \end{bmatrix}$, where $B = \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$.

13. In how many ways can 3 boys and 4 girls be arranged in a row so that all the 3 boys are together?

14. Find the number of straight lines and triangles that can be formed out of 20 points of which 8 are collinear.

15. Two cards are drawn from a pack of 52 cards. What is the probability that both are face cards.

16. Find the converse and contrapositive of the compound proposition "If the questions are easy then students score better marks".

17. Two numbers are in the ration 3 : 5. If 5 is added to each, they are in the ratio 2 : 3, find the numbers.

18. TD on bill was ₹100 and Banker's Gain was ₹10, what is the face value of the bill?

19. What is the market value of 12% stock when an investment of ₹6900 produces an income of ₹720.

20. Abhishek Purchase a bicycle costing ₹12,000, of the rate of sales tax is 9%, calculate the total amount payable by him.

21. The angle of elevation of the top of a chimney at a distance of 100 metres from a foot is 30°. Find its height.

22. If $\tan A = \frac{1}{3}, \tan(A+B) = \frac{1}{7}$ find tan B.

23. Express sin 5θ + sin θ as product of two functions.

24. If the radius of the circle $x^2 + y^2 + 4x - 2y - k = 0$ is 4 units, find k.

PART –C

III. Answer any TEN questions. **10 × 3 = 30**

25. Solve by cramer's rule :

$2x + y = 1$

$x - 3y = 4$

26. Show that $\begin{vmatrix} x & y & y \\ y & x & y \\ y & y & x \end{vmatrix} = (x+2y)(x-y)^2$

27. Find the number of permutations of the letters of the word COMMITTEE.

(i) How many of them begin with T and end with T?

(ii) How many of them end with MITE?

28. Two fair coins are tossed simultaneously. Find the probability of

(i) getting two heads. (ii) at least one head (iii) exactly one head

29. A couple appears in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and the probability of wife's selection is $\frac{1}{5}$. What is the probability that.

(i) Both of them are selected (ii) Only one of them will be selected

(iii) None of them will be selected

30. Find the middle term in the expansion of $\left(x - \frac{1}{2y}\right)^{10}$

31. Residue into partial fractions : $\frac{x+1}{(x-2)(x-3)}$

32. If the compound proposition P $\rightarrow$ (qvr) is false, the find the truth values of p, q and r.

33. The monthly income of A and B are in the ratio 3 : 4 and their expenditure are in the ratio 1 : 2, If each saves ₹2,000 per month, find their monthly income.

34. 5 men each working 9 hours a day can finish a work in 30 days. How many men are required to finish eight times the work in 25 days each working 8 hours a day?

35. Which is better investment 8% stock at 100 or 9% stock at 98?

36. Chandana purchases an article for ₹5,400 which include 10% rebate on the marked price an 20% sales tax on the remaining price. Find the market price of the article.

37. Prove that : $\frac{\sin 3\theta}{1+2\cos 2\theta} = \sin\theta$

38. Show that the line $2x + y + 2 = 0$ is a tangent to the circle $x^2 + y^2 + 6x + 2y + 5 = 0$.

PART –D

IV. Answer any SIX questions. **6 × 5 = 30**

39. A team of eleven is to be chosen out of 16 cricket players of whom 4 are bowlers and 2 all wicket keepers. In how many ways can the team be chosen so that

(i) There are exactly 3 bowlers and one wicket keeper

(ii) There are at least 3 bowlers and at least one wicket keeper

40. Find the coefficient of x^5 in $\left(x+\frac{1}{x^2}\right)^{17}$

41. Resolve into partial fractions : $\frac{3x+4}{(x+1)^2(x-1)}$

42. Show that $\sim(p \vee q) \rightarrow (\sim p \wedge \sim q)$ is a tautology.

43. Divide ₹1,647 into 3 parts such that $\frac{3}{7}^{th}$ of the first, $\frac{2}{3}^{nd}$ of the second and $\frac{4}{5}^{th}$ of the third are equal.

44. A bill for ₹14,600 drawn at 3 months after date was discounted on 11-11-99 for ₹14,320. If the discount rate is 20% p.a, on what date was the bill drawn?

45. ABC company required 1000 hours to produce first 30 engines. If the learning effect is 90%, find the total labour cost at ₹20 per hour to produce total of 120 engines.

46. Maximize $Z = 30x + 5y$

Subject to constraints $x + 3y \geq 3$

$x + y \geq 2$

$x, y \geq 0$

47. A person is at the top of a tower 75 feet hight. From there he observes a vertical pole and finds the angles of depression of the top and the bottom of the pole which are 30° and 60° respectively. Find the height of the pole.

48. Prove that $\frac{\sin 6A + \sin 2A + 2\sin 4A}{\sin 7A + \sin 3A + 2\sin 5A} = \frac{\sin 4A}{\sin 5A}$

PART – E

V. Answer any ONE question. **1 × 10 = 10**

49. (a) Solve by matrix method (6)

$3x + y + 2z = 3$

$2x - y - z = -3$

$x + 2y + z = 4$

(b) Using binomial theorem, find the value of $(0.99)^4$ upto 4 decimal place. (4)

50. (a) Show that the points (1, 0), (2, −7), (8, 1) and (9, −6) are concyclic. (6)

(b) Archana a dietician wishes to mix types of foods F_1 and F_2 i such a way that the vitamin contents of the mixture contains at least 6 units of vitamin A and 8 units of vitamin B food F_1 contains 2 units/kg of vitamin A and 3 units / kg of vitamin B while food F_2 contains 3 units/Kg of vitamin A and 4 units / kg of vitamin B. food F_1 costs ₹50 per kg and food F_2 costs ₹75 per kg formulate the problem as L.P.P to minimize the cost of the mixture.

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II PUC MODEL QUESTION PAPER - 4

(FOR THE YEAR 2020-21)

Time : 3 Hours 15 Minutes **Sub.: Basic Mathematics (Code:75)** **Max. Marks: 100**

Instructions:

(i) The question paper has 5 parts A, B, C, D and E. Answer all the parts.

(ii) Part-A carries 10 marks, Part-B carries 20 marks, Part-C carries 30 marks, Part-D carries 30 marks and Part-E carries 10 marks.

(iii) Write the question number properly as indicated in the question paper.

PART –A

I. Answer ALL the questions. **10 × 1 = 10**

1. If $A=\begin{bmatrix}1 & 2 & 4\\ -1 & 3 & -2\end{bmatrix}$, $B=\begin{bmatrix}3 & -4 & -1\\ 1 & 5 & -2\end{bmatrix}$, find A + B.

2. How many four digit numbers can be formed using the digits 2, 7, 6, 1, 9. 8?

3. What is the probability of getting a multiple of 3 when a fair die is rolled?

4. Negate the proposition: $\sim p \vee q$.

5. Find the compound ratio of 3:4 & 4:7.

6. Find the present value of ₹2,320 due 2 years hence at 8% p.a.

7. What income can be obtained from ₹8000 of 4% stock.

8. Give the formula for learning index.

9. If $\sin A=\frac{1}{2}$, find sin 3A.

10. Find the equation of a circle whose end poits of a diameter are (2, 0) & (0, 2).

PART –B

II. Answer any TEN questions. **10 × 2 = 20**

11. Find x if $\begin{bmatrix}3 & x\\ 4 & 7\end{bmatrix}$ is a symmetric matrix.

12. If $A=\begin{bmatrix}3 & -1\\ 2 & 1\end{bmatrix}$, $B=\begin{bmatrix}3 & 0\\ 1 & -2\end{bmatrix}$, find |AB|.

13. Find 'n' if ${}^{n}P_{5} = 20.{}^{n}P_{3}$.

14. Find the number of straight lines and triangles that can be formed out of 20 points of which 8 are collinear.

15. If $P(A) = \frac{2}{5}$, $P(B) = \frac{1}{5}$, find $(A \cup B)$ if A & B are independent events.

16. If the compound proposition $p \rightarrow (\sim q \vee r)$ is a false proposition, then find the truth values of p, q and r.

17. If $a:b = 2:3$, $b:c = 6:13$, find $a:b:c$.

18. BG on a certain bill due after 6 months at 4% interest p.a is ₹20. Find BD and TD of the bill?

19. How much of 8% stock at 96 can be purchased for ₹4,800? Also find the income obtained?

20. Raj paid ₹60 as sales tax on a watch worth ₹1,200. Find the rate of sales tax.

21. The angle of elevation of the top of a tree at a distance 100m from its foot is 30°. Find its height.

22. If $\tan A = \frac{5}{6}$, $\tan (A + B) = 1$, show that $\tan B = \frac{1}{11}$.

23. Prove that $\frac{\sin 2\theta}{1+\cos 2\theta} = \tan\theta$.

24. Find the length of chord of the circle $2x^2 + 2y^2 - 12x + 8y + 10 = 0$ intercepted by the x-axis.

PART –C

III. Answer any TEN questions. **3 × 10 = 30**

25. If $A = \begin{pmatrix} 1 & 3 \\ 1 & 0 \end{pmatrix}$, prove that $A^2 - A - 3I = 0$, where I is the identity matrix of 2 × 2.

26. Prove that $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2b^2c^2$.

27. In how many can all the letters of the word ACCOUNTANT be arranged? In how many of them vowels are always together?

28. 3 coins are tossed simultaneously. Find the probability of getting (a) exactly 1 head, (b) atleast 2 head (c) atmost 1 head.

29. A couple has 2 children. Find the probability that both are boys if it is known that (a) one of the children is a boy (b) older child is a boy.

30. Find the 5th term in the expansion of $\left(\frac{a}{2} + \frac{3}{b}\right)^{10}$.

31. Resolve $\frac{x+1}{(x-1)(x-3)}$ into partial fractions.

32. Write the converse, inverse and contrapositive of the statement "If x divides y then z is the remainder."

33. If $x:y = 2:3$, find $\frac{2x^2 + 5y^2}{x^2 + y^2}$.

34. 2 taps separately fill a tank in 12 & 15 minutes respectively. A drain pipe can empty a full tank in 20 minutes. If all three pipes are opened together when the tank is empty, then in what time will the tank be full?

35. Shriji holds ₹2,100 of 3% stock. He sells at ₹121 and invests the proceeds in 5% stock. There by his income increases by ₹14. Find the market price of 5% stock.

36. When the rate of ST is decreased from 9% to 7% for a radio, Gowri has to pay ₹632 less for it. What is the listed price of the radio?

37. Prove that: $\sin(45° + A) + \cos(45° + A) = \sqrt{2}.\cos A$.

38. Find the equation of a circle having $x + y = 4$ and $x - y = 2$ as the equations to two of its diameters & passing through the point $(2, -1)$.

PART –D

IV. Answer any SIX questions. **6 × 5 = 30**

39. An examination paper consists of 12 questions divided in parts A & B. Part A has 7 questions and Part B has 5 questions. A candidate is required to answer any 8 questions selecting atleast 3 from each part. In how many ways can the candidate select the questions?

40. Find the term independent of x in $\left(\sqrt{x} + \frac{1}{3x^2}\right)^{10}$.

41. Resolve into partial fractions: $\frac{9x + 27}{(x+1)(x-2)^2}$.

42. Verify if the propositions $p \leftrightarrow q$ and $(p \rightarrow q) \wedge (q \rightarrow p)$ are logically equivalent or not.

43. 5 men each working for 9 hours a day can finish a work in 30 days. How many men are required to finish eight times the work in 25 days each working 8 hours a day?

44. A bill of ₹3,500 due for 3 months was drawn on 27 March 2018 and was discounted on 18 April 2018, at 7% p.a. Find the Banker's discount & discounted value of the bill.

45. A company has 80% learning effect and spends 1000 hours to produce the first lot of the product. Estimate the labour cost of producing 16 lots of the product if the labour cost is ₹50 per hour.

46. Solve the following LPP using graphical method. Maximise $Z = 2x + 3y$,

Subject to the constraints $x + y \leq 400$

$2x + y \leq 600$

and $x \geq 0, y \geq 0$

47. From the top of a cliff, the angles of depression of two boats in the same vertical plane as the observer are 30° and 45°. If the distance between the boats is 100m, find the height of the cliff.

48. Prove that $\frac{\cos 7x + \cos 3x - \cos 5x - \cos x}{\sin 7x - \sin 3x - \sin 5x + \sin x} = \cot 2x.$

PART –E

IV. Answer any six questions. **6 × 5 = 30**

49. (a) Solve the following equations using matrix method:

$3x + y + 2z = 3, \quad 2x - 3y - z = -3, \quad x + 2y + z = 4.$ (6M)

(b) Find the value of $(1.1)^5$ upto 4 decimal places, using Binomial Theorem. (4M)

50. (a) Show that the points (1, 0), (2, –7), (8, 1) and (9, –6) are concyclic. (6M)

(b) A furniture maker has 6 units of wood and 28 hours of free time in which he makes two decorative screens. He estimates that model I requires 2 units of wood and 7 hours of tree. While model II requires 1 unit of wood and 8 hours of time. The costs of each type of screen is ₹180 and ₹80 respectively. Formulate the LPP so as to maximise his sales revenue. (4M)

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