Programme	Master of Science Mathematics (FYIP)	Master of Arts English (FYIP)	Master of Commerce (FYIP)
Exam Code	508401	116401	508301
Course Code	FMAL-1031	FENL -1031	FCOL-1031

Paper Code: 1106

Semester-I

Course Title: Basic Punjabi

Time Allowed: 3 Hours   Max Marks 40

Note: ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ।ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ।ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ। ਹਰੇਕ ਸਵਾਲ ਦੇ 8 ਅੰਕ ਹਨ।

ਸੈਕਸ਼ਨ A

1. ਪੈਂਤੀ ਅੱਖਰੀ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਿਓ।
2. ਹੋੜਾ ,ਕੰਨਾ ਅਤੇ ਔਕੜ ਲਗਾ ਕੇ ਪੰਜ ਪੰਜ ਸ਼ਬਦ ਬਣਾਓ।

ਸੈਕਸ਼ਨ B

3. ਸਾਧਾਰਨ ਸ਼ਬਦ ਦੀ ਪਰਿਭਾਸ਼ਾ ਦੱਸ ਕੇ ਕੋਈ 12 ਸ਼ਬਦ ਬਣਾਓ।

4. ਬੇ, ਅਣ ਅਤੇ ਉਪ ਅਗੇਤਰ ਲਗਾਕੇ ਪੰਜ – ਪੰਜ ਸ਼ਬਦ ਬਣਾਓ।

ਸੈਕਸ਼ਨ C

5. ਬਾਜ਼ਾਰ ਨਾਲ ਸੰਬੰਧਿਤ ਸ਼ਬਦਾਵਲੀ ਦੇ ਕੋਈ 15 ਸ਼ਬਦ ਬਣਾਓ।
6. ਵਪਾਰ ਨਾਲ ਸੰਬੰਧਿਤ ਸ਼ਬਦਾਲੀ ਦੇ 15 ਸ਼ਬਦ ਬਣਾਓ।

ਸੈਕਸ਼ਨ D

7. ਰੁੱਤਾਂ ਦੇ ਨਾਂ ਲਿਖੋ।
8. ਹਫ਼ਤੇ ਦੇ ਦਿਨਾਂ ਦੇ ਨਾਂ ਲਿਖੋ।

Exam Code: 508401   Paper Code: 1115

Programme: Master of Science (Mathematics) (FYIP) Semester- I
Course Title: Communication Skills in English
Course Code: FMAL- 1102

Time Allotted: 3 Hours   Max Marks: 40

Note: Attempt five questions in all, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

Section A

1. What are the various features of Reading skills?

2. What do you mean by Reading skills and what are the various kinds of Reading purposes?

Section B

3. Read the following comprehension passage and answer the questions given below.

Drug addiction is a major social evil of modern times. It has transcended barriers of caste, color, creed and sex. It is a problem that is eating into the vitals of the society. In the beginning, a person takes a drug out of curiosity. But slowly it becomes an incurable habit. There are some who take drugs simply for the thrill it gives them. The tragedy is that once a person gets used to taking any kind of intoxicating drugs, it becomes an addiction. His body develops a kind of dependence on the drug. He has to steadily increase the dose. Even if at any point of his life, he realizes his folly, it extremely becomes difficult for him to give up. It is like being in the clutches of a monster. It is pathetic to see a drug addict when he does not get his usual dose. His whole body writhes in pain, which drives him to madness. Besides, taking drugs is very expensive. Therefore, it drives drug addicts to stealing, committing petty crimes and other anti-social activities. It is not surprising that drug addicts become anti-social elements. Drugs completely destroy their mental faculties to think clearly and to rationalise.

    i. What is the suitable title for this passage?
    ii. Why does a person take drugs in the beginning?
    iii. When does drug-taking becomes an addiction?
    iv. What happens when a drug addict does not get his usual dose?
    v. What do drugs finally do to a drug addict?
    vi. How does a drug addict suffer physically?
    vii. What do you mean by anti-social activities?
    viii. Make a sentence of the word "expensive".

4. Read the following comprehension passage and answer the questions given below.

True happiness always springs from within. It is a subjective quality, independent of one's material circumstances. A contented mind is an essential condition of happiness. It does not mean that a man should have no aspiration in life; but wild cravings of the heart should always be subdued. Contentment stands for an uncomplaining acceptance of whatever happens in life. One should, of course, do one's best to improve one's circumstances and position, but one should be prepared for defeat or failure. Contentment should be supplemented with a readiness for self-sacrifice. A good act, a noble deed, a gesture of good-will towards others goes a long way in bringing happiness. Selfishness and ill-will towards others are hostile to happiness. The maximum amount of true happiness will always result from a pursuit that is not tainted by selfishness. The person, whose mind dwells on the things that are true, honourable, just, pure; whose mind is full of kind purpose and whose life is full of kind deeds, is the happiest of all beings. "My mind to me a kingdom is" - that sums up the attitude to life of a happy man. Thus the key to happiness in life is contentment combined with a spirit of service to others. All other formulae and recipes for seeking happiness fail in the long run.

i. Which is true?

(a) true happiness depends upon material things
(b) happiness is not a state of mind
(c) contentment is the basis of happiness
(d) service to others brings happiness

ii. "Contentment" means:

(a) having no aspiration in life
(b) control over wild desires
(c) living in poverty
(d) avoiding those needing help

iii. "My mind to me a kingdom is". Explain it.

(a) I am the king of my mind.
(b) My mind is like the kingdom.
(c) Internal contentment is all important to me.
(d) Mind is real kingdom.

iv. 'Springs' means:

(a) jumps
(b) takes birth
(c) attacks
(d) runs fast

v. One of the following does not lead to happiness:

(a) a good act
(b) a gesture of goodwill
(c) a feeling of ill will
(d) a spirit of service to others

vi. What is the synonym of the word 'happiness'?

(a) bliss
(b) anxiety
(c) excitement
(d) satisfaction

vii. What is the antonym of the word 'defeat'?

(a) fall
(b) victory
(c) triumph
(d) evil

viii. Make a sentence with the word "honourable".

Section C

5. Write a letter to your younger brother who is a bookworm, advising him to take part in games.

6. Write a letter to the Chief Medical Officer to launch a drive against malaria.

Section D

7. What advantages does writing a memorandum offer in workplaces?

8. Draft the minutes of the meeting of the Central Students' Association of your college held to discuss postponement of local examination.

Exam Code: 508401　　　　　　　　Paper Code: 1214
　　　(20)

Programme: Master of Science (Mathematics) (FYIP)
Semester-I

Course Title: Microeconomics-I

Course Code: FMAL-1175

Time Allowed: 3 Hours　　　　　　　　Max Marks: 80

Note: Attempt any five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 16 marks.

Section-A

1. Distinguish between Demand and Supply functions. Explain the process of price determination in this context.　　　　16
2. Explain the concept of price elasticity of demand and examine the various methods of measurement.　　16

Section-B

3. Explain the Law of diminishing marginal utility in detail. And also give its importance.　　　　16
4. What is meant by price effect? Show that price effect is the combination of income and substitution effect.

　　　　16

Section-C

5. Explain the law of variable proportions in the context of theory of production. Also explain various stages of this law with the help of table and diagram.   16

6. Distinguish between External and internal Economics of scale. And discuss the relation of these Economies with the law of increasing returns.   16

Section-D

7. Discuss the nature of the short-run and long-run average cost curves. Why the long run cost curves are flatter than short-run cost curves?   16

8. Discuss the concept of total, average and marginal revenue. Also explain the relationship between AR, MR and elasticity of demand.   16

Exam Code: **508401**

(20)

Paper Code: **1211**

Programme: **Master of Science (Mathematics) (FYIP) Semester-I**

Course Title: **Calculus-I**

Course Code: **FMAL-1333**

Time Allowed: **3 Hours**

Max Marks: **80**

Note: **Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries equal marks.**

Section-A

1(a) Find g.l.b and l.u.b of the set $S = \left\{ \frac{3x+1}{2x+3} : |x - 1| < 2 \right\}$ (8)

(b) Prove that between any two distinct real numbers there is always a rational number and therefore, infinitely many rational numbers. (8)

2.(a) Let $f(x) = \begin{cases} 2, & x = 2 \\ a\,x^2 + b, & 2 < x \\ 2ax - b, & x < 2 \end{cases}$ Determine the constants a and b so that f may be continuous for all x. (8)

(b) Let f, g be two real valued functions such that $\lim_{x \to a} f(x) = l$ and $\lim_{x \to a} g(x) = m$ then $prove\ that\ \lim_{x \to a} fg(x) = lm$ (8)

Section-B

3(a) Find intervals in which the function $f(x) = x^3 - 6x^2 - 36x + 24$ is increasing or decreasing. (8)

(b) Find the equations of tangent and normal to the curve x = cost, y = sint at $t = \frac{\pi}{4}$ (8)

4(a) State and prove Lagrange Mean Value theorem. (8)

4.(b) Verify Rolle's theorem for $f(x) = cosx + sinx\ in\ 0 \leq x \leq 2\pi$ (8)

Section-C

5(a) Find the intervals of concave upward or downward for the following curve
$$y = 3x^5 - 40x^3 + 3x - 20$$ (8)

(b) Show that the asymptotes of the curve $x^4 - 5x^2y^2 + 4y^4 + x^2 - y^2 + x + y + 1 = 0$ cut the curve in atmost eight points which lie on rectangular hyperbola. (8)

6(a) Trace the curve $x(x^2 + y^2) = a(x^2 - y^2)$ (8)

(b) State and prove Intermediate value theorem (8)

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Section-D

7(a) Evaluate the following integrals as limit of sum $\int_1^3 (2x + 3)dx$ (8)

(b) Find the whole length of the curve $x^{2/3} + y^{2/3} = a^{2/3}$ (8)

8(a) Evaluate $\int_0^a x^2 (a^2 - x^2)^{3/2} dx$ (8)

(b) Find the area of the portion bounded by the curve $x(x^2 + y^2) = a(x^2 - y^2)$ and its asymptote. (8)

Exam Code: **508401**   Paper Code: **1212**
                                                                                  (20)

Programme: Master of Science (Mathematics) (FYIP)
Semester-I

Course Title: Coordinate Geometry

Course Code: FMAL-1334

Time Allowed: 3 Hours   **Max Marks: 80**

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carry equal marks. (16 marks)

Section A

Q1 (a) Check whether the lines $x^2 + 4xy + y^2 = 0$ form with the line $x - y = 4$ an equilateral triangle or not.   [8]

(b) If the pairs of straight lines $x^2 - 2pxy - y^2 = 0$ and $x^2 - 2qxy - y^2 = 0$ be such that each pair bisects the angle between the other pair, justify whether $pq = -1$.   [8]

Q2 (a) Does the equation $6x^2 + 5xy - 4y^2 + 7x + 13y - 3 = 0$ represents a pair of straight lines. If yes, find the point of intersection and the angle between them.   [8]

(b)   Find the equation of the pair of lines joining the origin to the points of intersection of the line $y = mx + c$ with the curve $x^2 + y^2 - a^2 = 0$. Validate the fact that they are perpendicular if $2c^2 = a^2(1 + m^2)$.

                                                                                  [8]

Section B

Q3 (a) Find the equation of the circle having its centre on the line $x + y = 0$ and passing through the points (1, -3) and (1,-5).   [8]

(b) For what value of k the equation $3x + 4y - k = 0$ may touch the circle $x^2 + y^2 = 10x$.   [8]

Q4. (a) Check whether the given circles are orthogonal or not: $x^2 + y^2 + 6y + 8 = 0$ and $x^2 + y^2 + 6x + 8y + 20 = 0$.   [8]

(b) Find the limiting points of the coaxial system of circles determined by

    $x^2 + y^2 + 6x + 6 = 0$ and $x^2 + y^2 - 6y + 6 = 0$. Also find the equation of their radical axis.   [8]

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Section C

Q5. (a) Find the equation of the normal to the parabola $y^2 = 4x$ which is perpendicular to the line $x + 3y + 7 = 0$. [8]

(b) Show that the tangents at the extremities of a focal chord of a parabola intersect each other perpendicular on the directrix. [8]

Q6. (a) Find the pole of the line $x - 2y + 3 = 0$ with respect to the ellipse $3x^2 + 4y^2 = 12$. [8]

(b) Check whether the line $3x - 4y - 5 = 0$ is a tangent to the hyperbola $x^2 - 4y^2 = 5$. If yes, find the point of contact. [8]

Section D

Q7. (a) Show that $t, \Delta\ and\ \theta$ are invariant when the equation $2x^2 + 3xy - 2y^2 - 7x + y - 2 = 0$ is transformed by shifting the origin to the point (1, 1). [8]

(b) Reduce the conic $4x^2 - 4xy + y^2 - 8x - 6y + 5 = 0$ to standard form and trace it. [8]

Q8. (a) For the standard ellipse show that equation of tangent at θ is $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta - 1 = 0$ [8]

(b) Find the centre and radius of circle given by $r = a\cos\theta + b\sin\theta$. [8]

Exam Code: **508401**

Paper Code: 1215
(20)

Programme: Master of Science (Mathematics) (FYIP)
Semester-I

Course Title: Statics

Course Code: FMAL-1336

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt five questions in all selecting at least one question from each section. The fifth question can be selected from any section. All questions carry equal (16) marks.

Section -A

1. (a) State and prove Lami's theorem.

   (b) The ends of an inelastic string 0.17m long are attached of two points A and B, 0.13m apart in the same horizontal line. A weight of 4kg is attached to the point O of the string 0.05m from end A. Find the tension in each portion of the string.

2. (a) If forces of magnitude P, Q, R act at a point parallel to the sides BC, CA, AB respectively of a ΔABC, prove that the magnitude of the resultant force is

$$\sqrt{P^2 + Q^2 + R^2 - 2QRcosA - 2RPcosB - 2PQcosC}$$

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(b) Force P, 2P, 3P act at a point in directions parallel to the sides of an equilateral triangle taken in order. Find the magnitude, directions and the line of action of the resultant.

Section-B

3. (a) Forces P, 2P, -P and 2P act along the sides AB, BC, CD and DA of a square ABCD and $P\sqrt{2}$ each along BD and CA. Show that the forces reduce to a couple and find its moment.

(b) Three like parallel forces 2R+S, 4R-S and 8N act at the vertices of a triangle. Find R and S if their resultant passes through the centroid of the triangle.

4. (a) State and prove resolution of a force into a force and a couple.

(b) A man carries a load at one end of a stick and the other end of which he holds in his hand. The stick is placed on his shoulder. If W is the weight of the load; a,b be the distance of the load and his hand from his shoulder; prove that the pressure on his shoulder is W $\left(1 + \frac{a}{b}\right)$.

Section -C

5. (a) A rigid wire, without weight, in the form of the arc of a circle subtending an angle α at its centre and having two weights P and Q at its extremities, rests with its convexity downwards upon a horizontal plane, show that θ if be the inclination to the vertical of the radius to the end at which P is suspended, then

$$\tan \theta = \frac{Q \sin \alpha}{P + Q \cos \alpha}$$

(b) One end of uniform rod is attached to hinge and the other end is supported by a string attached to the extremely of the rod. The rod and the string are inclined at the same angle α to the horizontal. Show that the action of the hinge is $\frac{w}{4} \sqrt{8 + cosec^2 \alpha}$ where W is the weight of the rod.

6. (a) A weight (W) is attached to an endless string of length l which hangs over two smooth pegs distance c apart in a horizontal line, prove pressure on each peg is

$$W \sqrt{\frac{l-c}{2(l-2c)}} .$$

(b) A ladder of weight W rests with one end against a smooth vertical wall and with the other resting on a smooth floor, if the inclination of the ladder to the horizon be 60°, find the horizontal force that must be

---

applied to the lower end to prevent the ladder from sliding down.

Section -D

7. (a) Show that the centre of gravity of the solid hemisphere lies on the central radius at a distance $\frac{3a}{8}$ from the centre.

   (b) show that the centre of gravity of the cone lies on its axis and divides it in the ratio 3:1.

8. (a) One side of a triangle is twice the other and on the longer side, an equilateral triangle is described. Find the centre of gravity of the lamina formed of the rectangle and the triangle.

   (b) An equilateral triangle is described on one side of the square of side 16m. Find the distance of centre of gravity from the vertex of the triangle.

Exam Code: **508401** Paper Code: 1213
(20)

Programme: Master of Science (Mathematics) (FYIP)
Semester-I

Course Title: Physical Chemistry

Course Code: FMAM-1085

Time Allowed: 3 Hours Max Marks: 60

Note: -

* Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 12 marks.

* Use of non - scientific calculator is allowed.

*Use of logarithm tables is allowed.

Section — A

1. (a) Derive expressions for molar heat capacities Cv and Cp in terms of internal energy change and enthalpy change and hence show that CP - Cv = R for one mole of an ideal gas. (4)
   (b) Show that for adiabatic expansion of an ideal gas.
   $$TV^{\gamma-1} = \text{Constant}$$
   (4)

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(c) Explain isothermal, adiabatic and isochoric process (4)

2. (a) Derive thermodynamically Kirchoff's equation.

(6)

(b) Derive an expression for entropy change of mixing of ideal gases. (6)

Section -B

3. (a) Draw a labeled phase diagram of water- system & discuss its salient features. (6)

(b) State and explain the term Phase, Component, Degree of freedom using suitable examples.

(6)

4. (a) State and Explain the law of chemical equilibrium, Name three different types of equilibrium constants and give their units and relationship between them.

(6)

(b) Explain the term Gibbs free energy. Also explain how does it vary with temperature and pressure.

(6)

Section - C

5. (a) Discuss in brief various methods of determination of order of the reaction. (6)

   (b) Differentiate between Order and Molecularity of the reaction. (3)

   (c) What is rate law? How does it differ from law of mass action? (3)

6. (a) Derive the expression for the rate constant for the first order reaction. Also` explain the characteristics of the first order reaction. (6)

   (b) For the decomposition of N_2O_5 in CCl_4 solution at 320k

$$2 N_2O_5 \longrightarrow 4NO_2 + O_2$$

   Show that the reaction is of first order and also calculate the rate constant

Time in mins	10	15	20	25	∞
Volume(inc.c)	6.30	8.95	11.40	13.50	34.75

   (6)

Section - D

7. (a) State and Expalin Kohlrausch's law. Why is it called law of independent migration of ions? How can we calculate degree of dissociation of a weak electrolyte. (6)

(b) Explain the various factors which affects the transport numbers. (6)

8. (a) Define transport number of an ion. Describe in detail Moving Boundary Method of determination of transport numbers of ions. (6)

(b) Explain in details the concept of reversible and irreversible cells. (6)

Exam Code: 508401   Paper Code: 1216
(20)

Programme: Master of Science (Mathematics) (FYIP)
Semester-I

Course Title: Mechanics

Course Code: FMAM-1396

Time Allowed: 3 Hours   Max Marks: 60

Note: Attempt five questions, selecting at least one question from each section. Each question carries equal marks. Students can use Non-Scientific calculators or logarithmic tables.

Section A

1. (a) Using the expression for velocity of a particle in spherical polar coordinates, drive acceleration of the particle moving in a space.   (8)

   (b) Find the expression for various area elements and volume element in spherical polar coordinate system.   (4)

2. (a) What is Coriolis force? What is its origin? Discuss the effect of Coriolis force on a particle moving in Northern hemisphere? Justify with proper analysis?

(8)

(b) What are the quantities which are invariant under Galilean Transformations? Prove that the laws of conservation of linear momentum and energy remain invariant under Galilean transformations?

(4)

Section B

3. Derive the relations between kinetic energy of individual particles and total initial kinetic energy in elastic scattering when it is observed from lab system. Also discuss the special case when incident particles and target particles are identical. (12)

4. a) What is impact parameter? Write its formula and hence discuss its significance. (4)

b) Derive an expression for reaction cross-section in case of Rutherford alpha particle scattering experiment?

(8)

Section C

5. (a) Discuss the conditions for various shapes of orbits from a graph showing the variation of centrifugal potential energy, gravitational potential energy and effective potential energy with radial distance from center of force. (7)

(b) A body moving under action of a central force describes a path $r = a\sin\theta$. Find the force law.

(5)

6. Derive the differential equation of orbit for a body moving under the effect of a central force by reducing the two-body problem into one body problem and prove that angular momentum of the body is always conserved in this case. (12)

Section D

7. Discuss the rotational motion of a rigid rotator and derive the expression for torque which is responsible for the rotation of angular momentum in this case.

(12)

8. Derive Euler's equations for the rotational motion of a rigid body. (12)