वर्धमान महावीर खुला विश्वविद्यालय, कोटा
रावतभाटा रोड , कोटा 324021 (राजस्थान)
फोन: - 0744-2470615, फैक्स: - 0744 - 2472525
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Internal Assignment

M.Sc. Previous (Mathematics)

प्रिय छात्र,

आपको M.Sc. Previous (Mathematics) के पाठ्यक्रम के विभिन्न प्रश्न पत्रों के सत्रीय कार्य दिए जा रहे है। आपको प्रत्येक प्रश्न पत्र के दिए गए सत्रीय कार्य करने हैं। इन्हें पूरा करके आप निर्धारित अंतिम तिथि से पूर्व अपने क्षेत्रीय केंद्र (जहाँ पर आपने प्रवेश लिया है) पर स्वयं अथवा पंजीकृत डाक से आवश्यक रूप से भिजवा दें। प्रत्येक सत्रीय कार्य 20 अंकों का हैं। इन प्राप्तांको को आपकी सत्रांत परीक्षा के अंकों में जोड़ा जायेगा। सत्रीय कार्य सादे अथवा A4 कागज पर स्वयं की हस्तलिपि में करें तथा प्रत्येक प्रश्न पत्र की पृथक फाइल बनाये। सत्रीय कार्यो का पुनर्मूल्यांकन नहीं होता है और न ही इन्हें सुधारने हेतु दुबारा स्वीकार किया जाता हैं। अत: आप एक बार में ही सही उत्तर लिखें। आप संलग्न निर्धारित प्रपत्र पर वांछित सूचना भरकर सत्रीय कार्य के साथ संलग्न करें।

नोट : छात्र यह सत्रीय गृहकार्य तथा पाठ्यसामग्री विश्वविद्यालय की वेबसाइट www.vmou.ac.in पर Student One View सुविधा पर अपनी स्कॉलर संख्या व जन्म तिथि एंटर करके प्राप्त कर सकता हैं।

Internal Assignment: M.Sc. Previous (Mathematics) Semester-I

1. पाठ्यक्रम कोड (Course Code).....

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2. पाठ्यक्रम का नाम (Program Name) .....
3. स्कॉलर संख्या (Scholar No.).....

						-						

4. छात्र का नाम .....

   Name of Student (in capital letters)

5. पिता का नाम .....

   Name of Father (in capital letters)

6. पत्र व्यवहार का पता .....

   .....

   .....

   Address for Corresponding

7. अध्ययन केंद्र का नाम ....

   Name of Study Centre

8. क्षेत्रीय केंद्र (Regional Centre).....

Ajmer	Bikaner	Jaipur	Jodhpur	Kota	Udaipur	Bharatpur

जमा करवाने का दिनांक (Date of Submission) .....

D	D	M	M	Y	Y	Y	Y

Internal Assignment: M.Sc. Previous (Mathematics) Semester-II

1. पाठ्यक्रम कोड (Course Code).....

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2. पाठ्यक्रम का नाम (Program Name) .....
3. स्कॉलर संख्या (Scholar No.).....

						-						

4. छात्र का नाम .....

   Name of Student (in capital letters)

5. पिता का नाम .....

   Name of Father (in capital letters)

6. पत्र व्यवहार का पता .....

   .....

   .....

   Address for Corresponding

7. अध्ययन केंद्र का नाम ....

   Name of Study Centre

8. क्षेत्रीय केंद्र (Regional Centre).....

Ajmer	Bikaner	Jaipur	Jodhpur	Kota	Udaipur	Bharatpur

जमा करवाने का दिनांक (Date of Submission) .....

D	D	M	M	Y	Y	Y	Y

Semester-I

Internal Assignment: January-2026 & July-2026

Program Name M.Sc. (Mathematics)

Paper Code – MAT-101(Advanced Algebra)

M.Sc. (Previous) Semester-I

Max. Marks 20

Note:- The Internal Assignment has been divided into three sections A, B and C. Write Answer as per the given instructions.

Section –A

(Very Short Answer Type Questions)

Note:- Answer all questions . As per the nature of the question you delimit your answer in one word, one sentence or maximum up to 30 words. Each question carries 1 (one) mark.

4 x1 = 4

1. (i). If O(G)=4 and O(H)= 5 then find O(GxH).

   (ii). If t:V⟶V' is the zero homomorphism then find im(t).

   (iii). Define Unique factorization domain.

   (iv). Define transcendental extension of a field.

Section – B

(Short Answer Questions)

Note :- Answer any two questions . Each answer should be given in 200 words. Each question carries 4 marks. 2 x4 = 8

2. If G be a group and N Δ G. If N and G/N are solvable then prove that G is solvable.
3. If R be a Euclidean ring, then prove that every non zero element in R is either a unit or can be written as product of a finite number of prime elements of R.
4. If V be a finite dimensional vector space over a field F, then Prove that for each non zero vector $v \in V$ then exists a linear functional $f \in V^*$ such that $f(v) \neq 0$
5. If K be a Galois extension of a field F and Characteristic of F be zero, then prove that the fixed field under the Galois group G(K/F) is F itself.

Section – C

(Long Answer Questions)

Note :- Answer any one question. Each answer should be given in 800 words. Each question carries 08 marks.

1 x 8 = 8

6. State and prove Jordan-Holder theorem.
7. If V is an inner product space then prove that for any vectors $u, v \in V$

   (a) $\|u+v\|^2 - \|u-v\|^2 = 4\langle u, v\rangle$

   (b) $\|u+v\|^2 + \|u-v\|^2 = 2\left(\|u\|^2 + \|v\|^2\right)$

Semester-I

Internal Assignment: January-2026 & July-2026

Program Name M.Sc. (Mathematics)

Paper Code – MAT-102 (Real Analysis and Topology)

M.Sc. (Previous) Semester-I

Max. Marks 20

Note:- The Internal Assignment has been divided into three sections A, B and C. Write Answer as per the given instructions .

Section –A

(Very Short Answer Type Questions)

Note:- Answer all questions . As per the nature of the question you delimit your answer in one word, one sentence or maximum up to 30 words. Each question carries 1 (one) mark.

4 x1 = 4

1. (i). Define second countable space.
   (ii). Define outer measure of a set.
   (iii). Define locally compact space.
   (iv). Define product topology.

Section – B

(Short Answer Questions)

Note :- Answer any two questions . Each answer should be given in 200 words. Each question carries 4 marks. 2 x4 = 8

2. Show that every bounded measurable functions f defined on a measurable set E is L-integrable on E.
3. Show that the space L_2 of a square summable function is a linear space.
4. Show that homeomorphism is an equivalence relation in the family of topological spaces.
5. Prove that two closed subsets of a topological space are separated iff they are disjoint.

Section – C

(Long Answer Questions)

Note :- Answer any one question. Each answer should be given in 800 words. Each question carries 08 marks.

1 x 8 = 8

6. State and prove Weierstrass approximation theorem.
7. (i). Show that second countable space is always first countable but converse is not true.
   (ii). Show that a subset A of a topological space (X, τ) is closed iff $\overline{A} = A$.

Semester-I

Internal Assignment: January-2026 & July-2026

Program Name M.Sc. (Mathematics)

Paper Code – MAT-103

(Integral Transforms and Integral Equations)

M.Sc. (Previous) Semester-I

Max. Marks 20

Note:- The Internal Assignment has been divided into three sections A, B and C. Write Answer as per the given instructions .

Section –A

(Very Short Answer Type Questions)

Note:- Answer all questions . As per the nature of the question you delimit your answer in one word, one sentence or maximum up to 30 words. Each question carries 1 (one) mark.

4 x1 = 4

1. (i). Find $L\left\{\frac{1}{\sqrt{t}}, p\right\}$

   (ii). If $M\{f(x)\} = F(p)$ then prove that $M\{x^a f(x)\} = F(p+a)$

   (iii). Define Abel's Integral Equation.

   (iv). Define reciprocal kernel..

Section – B

(Short Answer Questions)

Note:-Answer any two questions. Each answer should be given in 200 words. Each question carries 4 marks. **2 x4 = 8**

2. Evaluate $L^{-1}\left[\frac{p^2}{p^4+4a^4}\right]$

3. Find complex Fourier transform of $f(t) = \begin{cases} 1-t^2 & |t|<1 \\ 0 & |t|>1 \end{cases}$ and hence evaluate $\int_0^\infty \left(\frac{t\cos t - \sin t}{t^3}\right)\cos\frac{t}{2}\,dt$

4. Show that the integral equation

   $$g(x) = f(x) + \frac{1}{\pi}\int_0^{2\pi} \sin(x+t)\, g(t)\, dt$$

   possesses no solution for *f(x)= x* , but that it possesses infinitely many solutions when *f(x)*= 1.

5. Prove that If a kernel is symmetric, then all of its iterated kernels are also symmetric.

.Section – C

(Long Answer Questions)

Note:- Answer any one question. Each answer should be given in 800 words. Each question carries 08 marks. **1 x 8 = 8**

6. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, t > 0, x > 0$ subject to conditions

   (i) $u(0, t) = 0$

   (ii) $u = \begin{Bmatrix} 1 & 0 < x < 1 \\ 0 & x \geq 1 \end{Bmatrix}$ when t = 0.

   U(x, t) is bounded.

7. (i) Solve the integral equation:

$$g(x) = x + \lambda \int_{-\pi}^{\pi} (x \cos t + t^2 \sin x + \cos x \sin t)\ g(t)dt$$

   (ii)Solve the fredholm integral equation of second kind.

$$g(x) = x + \lambda \int_0^1 (xt^2 + x^2 t)\ g(t)dt$$

Semester-II

Internal Assignment: January-2026 & July-2026

Program Name M.Sc. (Mathematics)

Paper Code – MAT-201 (Differential Equations, Calculus of Variations and Special Functions)

M.Sc. (Previous) Semester-II

Max. Marks 20

Note:- The Internal Assignment has been divided into three sections A, B and C. Write Answer as per the given instructions .

Section –A

(Very Short Answer Type Questions)

Note:- Answer all questions. As per the nature of the question you delimit your answer in one word, one sentence or maximum up to 30 words. Each question carries 1 (one) mark.

4 x1 = 4

1. (i). Write the value of $J_{3/2}(x)$.

   (ii). Write generalized Riccati equation.

   (iii). Write the equation governing transverse vibrations of a membrane.

   (iv). Write Gauss's Hyper-geometric differential equation.

Section – B

(Short Answer Questions)

Note :- Answer any two questions . Each answer should be given in 200 words. Each question carries 4 marks. **2**

x4 = 8

2. Solve:- $x - t = \frac{x}{y^2}$
3. Find the characteristics of $y^2 r - x^2 t = 0$.
4. Solve the following problem $y'' + \lambda y = 0; y'(-\pi) = 0 = y'(\pi)$
5. Find the shape of the curve on which a bead is sliding from rest and accelerated by gravity will ship (without friction) in least time from one point to another.

Section – C

(Long Answer Questions)

Note :- Answer any one question. Each answer should be given in 800 words. Each question carries 08 marks.

1 x 8 = 8

6. State and prove necessary and sufficient condition for integrability of the total differential equation $Pdx + Qdy + Rdz = 0$.
7. (i). Solve in series $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + \left(x^2 - 1\right)y = 0$

   (ii) Prove that

$$_2F_1\left[-n, a+n\ ;\ c\ ;1\right] = \frac{(-1)^n (1+a-c)_n}{(c)_n}$$

Semester-II

Internal Assignment: January-2026 & July-2026

Program Name M.Sc. (Mathematics)

Paper Code MAT-202 (Mechanics)

M.Sc. (Previous) Semester-II

Max. Marks 20

Note:- The Internal Assignment has been divided into three sections A, B and C. Write Answer as per the given instructions .

Section –A

(Very Short Answer Type Questions)

Note:- Answer all questions . As per the nature of the question you delimit your answer in one word, one sentence or maximum up to 30 words. Each question carries 1 (one) mark.

4 x1 = 4

1. (i). Write expressions for moment of inertia (M.I.) of a circular ring of mass M and radius a about its diameter.

(ii) State principle of conservation of angular momentum.

(iii). Write equation of continuity in Cartesian form.

(iv). Define viscosity.

Section – B

(Short Answer Questions)

Note :- Answer any two questions . Each answer should be given in 200 words. Each question carries 4 marks.

2 x4 = 8

2. Two equal rods AB and BC, each of length l, smoothly jointed at B, are suspended from A and oscillates in a vertical plane through A. Show that the periods of normal oscillations are $\frac{2\pi}{n}$ where $n^2 = \left(3 \pm \frac{6}{\sqrt{7}}\right)\frac{g}{l}$
3. A uniform rod OA, of length $2a$, free to turn about its end O, revolves with uniform angular velocity w about its vertical OZ through O, and is inclined at a constant angle α to OZ, show that the value of α is either zero or $\cos^{-1}\left(\frac{3g}{aw^2}\right)$.
4. Use Lagrange's equations to find the equation of motion of a simple pendulum.
5. A circular disc, of radius a, has a thin rod pushed through its centre perpendicular to its plane, the length of the rod being equal to the radius of the disc. Show that the system can not spin with the rod vertical unless the angular velocity is greater than

$$\sqrt{\frac{2og}{a}}$$

Section – C

(Long Answer Questions)

Note :- Answer any one question. Each answer should be given in 800 words. Each question carries 08 marks.

1 x 8 = 8

6. A symmetrical top is set in motion on a rough horizontal plane with an angular motion about its axis of figure, the axis being inclined at an angle i to the vertical. Show that between the greatest approach to and recess from the vertical, the centre of gravity describes an arc

$$h\tan^{-1}\left(\frac{\sin i}{p-\cos i}\right)$$

where p and h have their usual meanings.

7. A mass of liquid surrounds a solid sphere of radius a and its outer surface, which is a concentric spheres of radius b, is subject to a given constant pressure P, no other force being in action on the liquid. The solid sphere suddenly shrinks into a concentric sphere. Determine the subsequent motion and the impulsive action on the sphere.

Semester-II

Internal Assignment: January-2026 & July-2026

Program Name M.Sc. (Mathematics)

Paper Code MAT-203 (Viscous Fluid Dynamics)

M.Sc. (Previous) Semester-II

Max. Marks 20

Note:- The Internal Assignment has been divided into three sections A, B and C. Write Answer as per the given instructions .

Section –A

(Very Short Answer Type Questions)

Note:- Answer all questions . As per the nature of the question you delimit your answer in one word, one sentence or maximum up to 30 words. Each question carries 1 (one) mark.

4 x1 = 4

1. (i). What do you mean by dynamical similarity?
   (ii). Define starting flow.
   (iii). Write the necessary condition for very slow motion.
   (iv). Write coefficient of skin friction at stationary plate.

Section – B

(Short Answer Questions)

Note:- Answer any two questions. Each answer should be given in 200 words. Each question carries 4 marks.

2 x4 = 8

2. What type of the motion do the following velocity components constitute?
   $u=a+by-cz;\ v=d-bx+ez$ and $w=f+cx-ey$ where a, b, c, d, e and f are arbitrary constants.
3. Formulate Stoke's second problem and discuss it's solution.
4. Derive boundary layer equations for the flow past a solid plane wall by asymptotic approach.
5. Explain Blasius-Topfer solution to steady boundary layer flow on a flat plate.

Section – C

(Long Answer Questions)

Note:- Answer any one question. Each answer should be given in 800 words. Each question carries 08 marks. 1 x 8 = 8

6. Explain
   (a). Nusselt Number
   (b). Prandtl Number

(c). Reynolds Number

(d). Grashoff Number

7. Describe temperature distribution in a pipe when walls of pipe are at constant temperature.