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Reg. No. : ....

D 2110 Q.P. Code : [D 07 PMA 06]

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, MAY 2014.

Second Year

Mathematics

MECHANICS

Time : Three hours Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

$(5 \times 20 = 100)$

1. (a) State and prove the D'Alembert's principle.

   (b) Derive the Lagrange's equation in terms of the Lagranigan function.

2. (a) Derive the Lagrange's equation for a charged particle in an electromagnetic field interms of the Rayleigh's dissipation function.

   (b) A bead is sliding on a uniformly rotating wire in a force-free space. Derive its equation of motion.

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Reg. No. : ....

D 2111 **Q.P. Code : [D 07 PMA 07]**

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, MAY 2014.

Second Year

Mathematics

OPERATION RESEARCH

Time : Three hours Maximum : 100 marks

Answer any FIVE questions.

Each questions carries 20 marks.

$(5 \times 20 = 100)$

1. (a) Maximize $z = 8x_1 + x_2$

Subject to : $8x_1 + x_2 \leq 8$

$2x_1 + x_2 \leq 6$

$3x_1 + x_2 \leq 6$

$x_1 + 6x_2 \leq 8$

$x_1, x_2 \geq 0$

Reg. No. : ....

D 2112 Q.P. Code : [D 07 PMA 08]

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, MAY 2014.

Second Year

Mathematics

TOPOLOGY

Time : Three hours Maximum : 100 marks

Answer any FIVE questions.

Each question carries 20 marks.

(5 × 20 = 100)

1. (a) State maximum principle and given example of topological space. If β is a basis for the topology of X, and $\mathcal{C}$ is a basis for the topology of Y, then prove that the collection $\mathcal{D} = \{B \times C \mid B \in \mathcal{B}, C \in \mathcal{C}\}$ is a basis for the topology of $X \times Y$.

(b) Consider the set $Y = [-1, 1]$ as a subspace of R. Which of the following sets are open in Y? Which are open is R?

$A = \{x \mid 1/2 < |x| < 1\}$

$B = \{x \mid 1/2 < |x| \leq 1\}$,

$$C = \left\{x \mid \tfrac{1}{2} \le |x| < 1\right\}$$

$$D = \left\{x \mid \tfrac{1}{2} \le |x| \le 1\right\}$$

$$E = \left\{x \mid 0 < |x| < 1 \text{ and } 1/x \notin Z+\right\}$$

2. (a) Let X be a Hausdoff space. Let A be a subset of X. Show that the point x is a limit point of A its every neighbour hood of x contains infinitely many points of A.

   (b) Show that $d'(x,y) = \dfrac{d(x,y)}{1+d(x,y)}$ is a bounded metric for X if d is a metric for X.

3. (a) Prove that the Cartesian product of connected space is connected.

   (b) Prove that a space X is locally connected if and only if for every open set U of X, each component of U is open in X.

4. (a) Define compact space. Prove that every compact subset of a Hausdorff space is closed.

   (b) Let X be a metrizable space. Prove that the following are equivalent.

   (i) X is compact

   (ii) X is limit point compact

   (iii) X is sequentially compact.

5. (a) Prove that every compact Hausdorff space is normal.

(b) State and prove Urysohn Lemma.

6. (a) Prove that a subspace of a completely regular space is completely regular also prove that a product of completely regular spaces is completely regular.

(b) Let X be completely regular. Let Y_1 and Y_2 be two compactifications of X having the extension property. Then prove that there is a homeomorphism ϕ of Y_1 on to Y_2 such that $\phi(x)=x$ for each $x \in X$.

7. (a) Prove that a metric space *(x, d)* is compact if and only if it is complete and totally bounded.

(b) State and prove As coli's theorem.

8. (a) Define path Homotopic. Show that the Map $P: R \to S'$ given by the equation $P(x)=(\cos 2\pi x, \sin 2\pi x)$ is a covering map.

(b) For $n \geq 2$, show that the n–sphere s^n is simply connected.

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Reg. No. : ....

D 2113 Q.P. Code : [D 07 PMA 09]

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, MAY 2014.

Second Year

Maths

COMPUTER PROGRAMMING (C++ THEORY)

Time : Three hours Maximum : 100 marks

Answer any FIVE questions.

$(5 \times 20 = 100)$

1. (a) Explain in detail about features of OOPs.

   (b) Discuss any two principles of OOPs.

2. (a) Give a brief note on derived data types.

   (b) List out and explain any three types of expressions.

3. (a) Discuss the various forms of get ( ) function supported by I/P stream.

   (b) Write a C++ program for swapping two numbers using call by value function.

4. (a) Explain friend function with an example.

   (b) Discuss in detail about copy constructor with a C++ program.

5. (a) Describe the rules for overloading operators.

   (b) Write a C++ program to multiply two numbers using multiple inheritance.

6. (a) Explain the applications of OOPs.

   (b) Briefly explain the types of control structures.

7. (a) Discuss the memory management operators.

   (b) Write a C++ program to find factorial of a given number using recursive function.

8. (a) Explain in detail about virtual base class with an example.

   (b) Write a C++ program to show the overloading of binary operators.

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Reg. No. : ....

D 2114 **Q.P. Code : [D 07 PMA 10]**

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, MAY 2014.

Second Year

Mathematics

FUNCTIONAL ANALYSIS

Time : Three hours Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

$(5 \times 20 = 100)$

1. (a) Let a Banach space B be the direct sum of the linear subspaces M and N, so that $B = M \oplus N$. If $z = x + y$ is the unique expression of vector z in B as the sum of vectors x and y is M and N, then a new norm can be defined on the linear space B by $\|z\|' = \|x\| + \|y\|$. Prove that this actually in a norm. If B' symbolizes the linear space B equipped with this new norm, prove that B' is a Banach space if M and N are closed in B.

7. (a) Prove that every maximal left ideal in a Banach algebra A is closed.

(b) With usual notation on prove that if $1-xr$ is regular, then show that $1-rx$ is also regular.

(c) If I is a proper closed two – sided ideal in A, then prove that the quotient algebra A/I is a Banach algebra.

8. (a) If A is a commutative B^*- algebra, then prove that gelf and mapping $x \to \hat{x}$ is an isometric * – isomorphism of A onto the commutative B^*-algebra.

(b) State and prove that Banach – stone theorem.
