BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

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Name: ……………………………………………. Roll No.: ………………………………………..
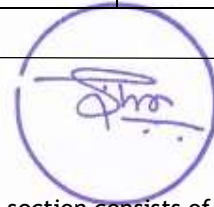
Branch: ……………………………………………. Signature of Invigilator: …………………….

Semester: VIth   Date: 26/04/2022 (MORNING)

Subject with Code: ME365 DESIGN OF MECHANISMS

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.

2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**

3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.

4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.

5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.

6. Write on both side of the leaf and use pens with same ink.

7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.

8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.

9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.

10. Always maintain the highest level of integrity. Remember you are a BITian.

11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

CLASS: B. TECH.   SEMESTER : VI
BRANCH: MECHANICAL   SESSION : SP/22

SUBJECT: ME365 DESIGN OF MECHANISMS

TIME: 02 hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains two sections. Section A contains 30 MCQ's of 01 marks each. In Section B, attempt any 04 out 05 short answer questions. Each question in Section B carries 05 marks.
2. The missing data, if any, may be assumed suitably.

Section - A

Q.1 In an oscillating cylinder engine, which link of a slider-crank mechanism act as the cylinder?   [01]
(a) crank   (b) connecting rod
(c) frame   (d) slider

Q.2 In a four-bar mechanism, if the shortest link is fixed, then the inversion obtained will be   [01]
(a) Crank-rocker   (b) Double-Crank
(c) Double-rocker   (d) none of these

Q.3 For an eight bar mechanism with all lower pairs, the number of lower pairs required for one degree of   [01]
freedom of the mechanism will be
(a) 04   (b) 07
(c) 10   (d) 13

Q.4 Whitworth quick return mechanism is obtained by fixing   [01]
(a) Frame   (b) crank
(c) connecting rod   (d) slider

Q.5 Which of the following is a turning pair?   [01]
(a) Piston and cylinder of a reciprocating engine (b) Shaft with collars at ends fitted in a hole
(c) Lead screw of a lathe with nut   (d) Ball and socket joint

Q.6 In a 4 – bar linkage, if the lengths of shortest, longest and the other two links are denoted by s, l, p and   [01]
q, then it would result in Grashof's linkage provided that
(a) l + p < s + q   (b) l + p = s + q
(c) l + s < p + q   (d) none of these

Q.7 Which of the following is an inversion of double slider crank chain?   [01]
(a) Coupling rod of a locomotive   (b) Pendulum pump
(c) Elliptical trammels   (d) Oscillating cylinder engine

Q.8 In a Watt Six-bar mechanism, ternary links are connected   [01]
(a) together   (b) through a binary link
(c) through a ternary link   (d) none of these

Q.9 In a Stephenson Six-bar mechanism, ternary links are connected
(a) together   (b) through a binary link
(c) through a ternary link   (d) none of these

Q.10 A higher pair is equivalent to two lower pairs   [01]
(a) True   (b) False

Q.11 Which of the following task is related to coupler link   [01]
(a) Motion generation   (b) Path generation
(c) Function generation   (d) both (a) and (b)

Q.12 Function generation relates output link with   [01]
(a) Fixed link   (b) Input link
(c) Coupler link   (d) none of these

Q.13 Two position motion generation can be accomplished by a simple rotation of coupler link about   [01]
(a) Instantaneous centre   (b) centrode
(c) Pole   (d) none of these

Q.14 The position of fixed pivot is unique in motion generation with [01]
(a) Two prescribed positions (b) Three prescribed positions
(c) both (a) and (b) (d) none of these

Q.15 For path generation for 3 prescribed points, which of the following is a free choice [01]
(a) location of fixed pivots (b) length of input link
(c) initial position of input link (d) all of these

Q.16 Which of the following is a graphical method for function generation [01]
(a) Overlay method (b) Freudenstein equation
(c) Loop closure technique (d) Complex number method

Q.17 The dyad is a pair of [01]
(a) Input and coupler links (b) Input and output links
(c) Two vectors (d) all of these

Q.18 One vector equation is equivalent to [01]
(a) One scaler equation (b) Two scalar equations
(c) Three scaler equations (d) Four scaler equations

Q.19 Using dyad form synthesis, the number of scalar free choices for three position motion generation is [01]
(a) 01 (b) 02
(c) 03 (d) 04

Q.20 Which of the following method is applicable for function generation [01]
(a) Standard form (b) Freudenstein equation
(c) Loop closure technique (d) all of these

Q.21 Using Loop closure equation technique, the length of which link is assumed to be unity [01]
(a) Fixed link (b) Input link
(c) Coupler link (d) none of these

Q.22 Freudenstein equations is a scalar approach [01]
(a) True (b) False

Q.23 The rate of change of angular velocity is known as [01]
(a) angular displacement (b) acceleration
(c) angular acceleration (d) tangential acceleration

Q.24 Which of the following analysis needs to be done before acceleration analysis [01]
(a) position analysis (b) velocity analysis
(c) force analysis (d) both (a) and (b)

Q.25 In kinetostatic analysis, the unknowns are [01]
(a) joint reactions (b) inertia forces
(c) load torque (d) accelerations

Q.26 $e^{i\pi}$-1 = ___ [01]
(a) 0 (b) 1
(c) -2 (d) -1

Q.27 A vector is represented by a complex number x+iy. If it is multiplied by $e^{i\pi/3}$, the new vector will be rotated by an angle [01]
(a) 0° (b) 30°
(c) 60° (d) 90°

Q.28 $e^{-i\pi}$ represents a unit circle with centre at [01]
(a) origin (b) (1,0)
(c) (-1,0) (d) does not represent a circle

Q.29 If T is kinetic energy, V is potential energy, then the Lagrangian L is [01]
(a) T-V (b) T+V
(c) V-T (d) TV

Q.30 Relative motion between the fixed centrode and the moving centrode is pure rolling [01]
(a) True (b) False

Attempt any four (04) questions. Each question carries equal marks.

31. Write the names of six possible lower pairs/joints. [05]
32. Describe motion generation with an example. [05]
33. What is a dyad. How it is used for synthesis of four bar mechanism. Explain with diagrams and equations. [05]
34. Describe fixed centrode and moving centrode. [05]
35. Determine the Chebyshev spacing of x for a function $y = x^3$ in the range 1 < x < 5 where four (04) precision points are to be prescribed. [05]