INDIAN INSTITUTE OF TECHNOLOGY MADRAS,
Department of Metallurgical & Matls. Engineering, (MME)
Materials Forming Laboratory,(MFL).

PART I

END SEMESTER EXAMINATION, 2011 BOOK

Date of Exam: "F" SLOT,2010, 13 hrs to 15 hrs

SUBJECT: 3 MM 5620 METAL FORMING EQUIPMENT

Class: I M.Tech MME. Total Number of Students taking the Examination : **04**

Time Duration of Examination: 03 hrs. Marks : 100 & will be converted for 50

DATE OF EXAMINATION: …02nd May, 2011……

Roll No: ……

Name: ……..

Class: ……..

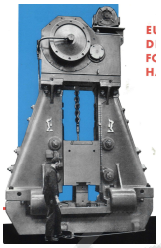
Branch: ……

Semester: ……

There are PART "I & Part "II". Part I consists of True or False Questions. Write in brackets provided **"True or False"** and not T or F. Part II consists of abstractive questions. While **there is no choice in part I**, **answer for 50 marks choosing full questions from part II**. Partial answers will not be evaluated. The Question cum Answer Book will not be returned to the Candidates or to the Office since these are objective type of questions. No extra copy will be prepared other than **eight** (for students taking the Examination). No separate answer sheets will be provided. Write the ansers in the question book itself.

Question Papers were prepared, typed and print out were taken by Prof. Dr. P. Venugopal

TEACHER / EXAMINER: em. Prof. Dr. P. Venugopal. Phone: 4764., Mobile: 9444489973



ANSWER TRUE OR FALSE IN THE BRACKETS PROVIDED

A. ON HAMMERS

1. Velocity of drop hammer is lower than power double action hammer. [ ]

2. Accessibility to the working zone in a guided type pneumatic air hammer is greater than the "C" type hammer. [ ]

3. Blow Efficiency of hammer characterizes the restitution losses of tup, anvil and Foundation. [ ]

4. Number of blows per minute also characterizes the blow efficiency of the hammer. [ ]

5. For a given blow, harder the blow, better is the blow efficiency. [ ]

6. Since hard blow ensures better blow efficiency, cold forging can be ideally can be done in a hammer. [ ]

7. The restitution loss is of tup is more in a single action hammer. [ ]

8. The losses in a pneumatic hammer (vide Sankey Diagram) can be totally avoided in a pneumatic air hammer by preheating the air. [ ]

9. Rigid foundation is essential in power hammers. [ ]

10. Drop hammers employ swinging foundation. [ ]

11. Derivation used for theoretical number of blows per minute is also useful for the design aspect concerned with resonance effect. [ ]

12. The important objective of foundation is to ensure a steady load on the ground. [ ]

13. Introducing an anvil cap increases the restitution effect in a single piece hammer. [ ]

14. Design change in respect of anvil block enable Class IV Forgings. [ ]

15. Lower the coefficient of restitution, lower is the blow efficiency. [ ]

16. Lower the ratio of Tup to Anvil mass, better is the forming efficiency. [ ]

17. Vide question 16, to increase blow efficiency, anvil mass has to be increased. [ ]

18. Knowledge of static loads are sufficient in hammer foundation analysis. [ ]

19. Losses in the slip drive belt drop hammer are highest in the lift zone. [ ]

20. Vide Q.No.19, blow efficiency assumes greater importance. [ ]

21. The rigorous analysis on foundation is done with an objective to improve hammer system efficiency. [ ]

22. Eighen frequency : to Hammer frequency should be equal to one as a special case in Hammers. [ ]

23. In a woundable belt drop hammer the drive pulley has to be smaller in diameter to enable faster lift. [ ]

24. Vide Q. 23, locking of the tup is enabled. [ ]

25. Wear and tear in woundable belt drop hammer is more with respect to slip drive Belt drop hammer. [ ]

26. Blow efficiency can be low for a soft blow. [ ]

27. Besides pre-heating the air, the blow efficiency of a power air hammer can be increased by compressing the air above 8 bar. [ ]

28. An isothermal condition is more pertinent than adiabatic one in the analysis of energy Calculations in a double action power air hammer. [ ]

29. Phase lag is totally unavoidable in power air hammer. [ ]

30. Centralized compressor system ensures better system efficiency than built in compressor Pneumatic power hammer. [ ]

31. One way of decreasing the retardation stress in hammer is to reduce the Velocity. [ ]

33. Retardation stress characterizes the restitution effects. [ ]

34. "y" is always smaller than "rsinωt" in an air hammer and spring hammer driven by Crank. [ ]

35. Such a difference (Vide Q.34) is attributed to phase lag. [ ]

36. Shock wave velocity of steel is 5140 met/sec. [ ]

37. The power drawn by the motor in slip drive belt drop hammer is highest in the zone of retardation. [ ]

38. Woundable drop hammer is handicapped by the slip during the section of drop. [ ]

39. Refer Q. 37. The statement is not true in the zone of initial stretching. [ ]

40. To ensure, "t_0" (Q. 39), "a_0" must be aimed high so that, time for lift is reduced. [ ]

41. Oil hydraulic drop hammer ensures lower "t_0". [ ]

42. The constant a| in the analysis of "a_0" fouls with retardation stress. [ ]

43. Slip (Velocity) is maximum in the initial stretching of a chain drop hammer. [ ]

44. The Archimedean sprocket in the chain drop hammer is designed in such a way that, Radius is large at the start and small at the end. [ ]

45. The chain drop hammer requires a flywheel-clutch transmission. [ ]

46. A compromise is evolved in the chain drop hammer to minimize retardation stress And the time of lift. [ ]

47. The efficiency of the hammer is the ratio of kinetic to potential energy. [ ]

48. Locking to ensure suspension is greatly facilitated in chain drop hammer. [ ]

49. Suspension mechanism is indispensable in all hammers. [ ]

50. Statement vide Q. 49 leads to a conclusion that, automation is not possible in hammer forging. [ ]

51. Oil Hydraulic Drop Hammer is characterized by large mass of falling since lift force is of major concern. [ ]

52. Since flow rate by area is the velocity, the piston of the Oil Hydraulic Drop Hammer is of ram-cylinder type. [ ]

53. If a thin piston rod is used in oil hydraulic drop hammer, retardation stress is reduced. [ ]

54. Warm forging is not recommended in oil hydraulic drop hammer since, system efficiency is reduced. [ ]

55. Transient load zone characterizes the choice of dampening material in hammer foundation analysis.

56.A Radial Piston Pump employed in oil hydraulic drop hammer makes this machine very expensive. [ ]

57. "V_{MEAN}" is essential in computing the dynamic factor in hammer foundation analysis. [ ]

58. One advantage hammer foundation analysis is that, it enables determine the stiffness of the hammer. [ ]

59. Stiffness of the hammer a varying parameter. [ ]

60. Vide Q. 59, for design purposes, the highest stiffness must be considered. [ ]

61. Dynamic analysis of the built in compressor air hammer enables the evolution of Short stroke hammer for class IV Forgings. [ ]

62. Short stroke hammers are characterized by large dwell. [ ]

63. Since the stroke is short in short stroke hammer, the tup has to be held at T.D.C. [ ]

64. Possibility of nitriding the piston rod in short stroke hammers exists to avoid the harmful effects of retardation stress. [ ]

65.Nitriding of piston rod can eliminate copper coating of the piston rod. [ ]

66. Class IV Forgings are not possible in short stroke hammers. [ ]

67.For h_0/d_0 aspect ratio forgings, percussion presses are preferred concerning angle of tilt of slide. [ ]

68. For a low mass of fall in hammer, angle of tilt is less for a given energy. [ ]

69. Dry lubrication on guides of hammers near the B.B.C is advisable for better accuracy in the forging concerned with eccentric forging. [ ]

70. Angle of tilt with low mass single piece hammer with large height and low width is Advisable to overcome the error arising out of eccentric forging. [ ]

71. Main throttle valve connecting the Control and Working cylinders of a built in type Of pneumatic hammer is kept 80% open for suspension of hammer. [ ]

72. Adiabatic condition is assumed concerning the dynamics analysis of the pneumatic hammer. [ ]

73. A general statement can be made that, multiple impression forgings are not possible in all counter blow hammers. [ ]

74. Counter blow hammers with pneumatic slide spool valve is preferred with respect to mush room hydraulic valves. [ ]

75. Counter blow hammer reduces the coefficient of boundary friction. [ ]

76. Vide statement in Q.No.75, Counter Blow hammers are suitable for upset forging only. [ ]

77. If statement vide Q.75 is true, axial stress for a given d_0 and h_0 aspect ratio of forging, is less in C.B Hammer than Orbital Forging. [ ]

78. Even though compressed air used in air hammers, there is a specific advantage at The T.D.C. [ ]

79. Sabre Lever is introduced so that operator's intervention is enabled in ensuring mean swing position of the tup. [ ]

80. Travel control enables intermittent manipulation of forging by operator. [ ]

81. The blow energy can be varied in a power hammer only with travel and time control system. [ ]

82. Power hammers can have both travel and time control system. [ ]

83. Program disc has to be changed for zipping and un-zipping for varying the time in power hammer. [ ]

84. Phase lag is a serious problem in a centralized compressor-air hammer street. [ ]

85. Since the symmetric forging does not give rise to angle of tilt, the question of residual flash and incut becomes redundant. [ ]

86. To increase number of blows in a standard swager, one can increase the number of hammer and backers indefinitely. [ ]

87. The purpose of lobe in swage hammer is same as land and gutter in hammers. [ ]

88. The dies of the swage hammers are profiled to ensure radial blows. [ ]

89. Approach zone angle in swage dies depends upon manual feeding or lubricated condition of work piece. [ ]

90. Springs are essential in inverted swagers. [ ]

91. Swagers are ideal for laid-i-forgings. [ ]

92. Angle of tilt inferences enable identifying plating and upsetting. [ ]

93. Losses due to foundation are less in C.B Hammers. [ ]

94. In C.B. Hammers, the upper mass is kept heavier than lower to enable withdrawal of the dies so that, belt tension is decreased. [ ]

95.Canvas belt can also be used as a coupling medium in C.B Hammers. [ ]

96. Hydraulically coupled C.B. Hammers make use of hydraulic fluid for activating the die movements. [ ]

97. C.B. Hammers based on electro-mechanical coupling are characterized by their velocities at their limit dead centers. [ ]

98. Frictional losses in C.B. Hammers based on linear induction motor principles are more. [ ]

99. Belt tension limits the maximum opening of the two masses in Steel Belt coupled C.B. Hammers. [ ]

100. The Ajax Spring Hammer is characterized by spring force only as far as the Acceleration is concerned. [ ]

B. ON HYDRAULIC PRESSES

[1] The laboratory press of Materials Forming, IIT Madras is a single action press. [ ]

[2] Main pump that drives the piston of our lab press is the gear pump. [ ]

[3] The lab press is not provided with safety device for two operators. [ ]

[4] There is no need for a safety for the lab press since it is incorporated with a Pressure Relief Valve. [ ]

[5] The servo control unit of the lab press is employed to vary the angle of the gear pump to ensure different flow rate of the oil. [ ]

[6] The maximum angle of tilt of the axial piston pump on either side decides the maximum velocity of the slide. [ ]

[7] It is possible to vary the strain rate infinitesimally in our lab hydraulic press [ ]

[8] The application of our lab hydraulic press is confined to deep drawing only [ ]

[9] The die cushion provided at the bottom of our lab press is meant only for blank holding mechanism. [ ]

[10] The Electro hydraulic controller is used in conjunction with the manual control of the lever to ensure varying flow rate of the oil. [ ]

[11] The normal and equilibrium position of the manual lever are one and the same.

[ ]

[12] The above positions associate with locking & rising the slide reply. [ ]

[13] There is an accumulator incorporated in the circuit of our lab press. [ ]

[14] Such an accumulator is redundant in the lab press, since, the bi – directional axial piston pump will take care of the function of the accumulator. [ ]

[15] The dark arrow pointing out in a circle describes an uni-axial hydraulic pump.

[ ]

16] The dark arrows pointing out describe a bi-directional pump with variable flow rate. [ ]

[17] Symbol for a NON RETURN VALVE

[18] Symbol for a 2/2 DCV is:

[19] Symbol for 4/3 DCV is:

[20] Symbol for Pressure Relief Valve is:

[21] Symbol for Differential Cylinder is:

[22] Symbol for Ram Cylinder is:

[23] Fast Forward and Slow Working Cycle line diagram above the cylinder is:

[24] Ram Cylinder in hot extrusion process does not require a twin cylinder for return. [ ]

[25] Active force is smaller than main slide force. [ ]

[26] Just as effective pressures are calculated in sizing the pump, [ ]

effective flow rates are also to be calculated for sizing the pump. [ ]

[27] Torque to inertia is high in hydraulic engineering w.r.to. electrical engineering.

[ ]

[28] Column deflection is more for pull over type than push down type

hydraulic presses. . [ ]

[29] Multi-cylinders enable the far reach in position of the manipulators. . [ ]

[30] Accumulator driven hydraulic presses are necessary for stick-slip hot extrusion process. .

[ ]

[31] A hydraulic die cushion has an edge over the pneumatic one in terms of avoiding failure

of ejection rod. . [ ]

[32] Sizing of the accumulator requires the maximum of excess flow

discharged from the accumulator. .

[ ]

[33] For relatively low pressure in the system, a bag accumulator separating the nitrogen gas is

mandatory. [ ]

[34] The discharge pressure of the accumulator must necessarily be above the maximum pressure in the system. [ ]

[35] Dead weight accumulator obviates the problem of dieseling and thus, they are widely used in modern hydraulic presses. . [ ]

[36] The thrust is in the hydraulic press is uni-axial/multiaxial/biaxial. . [ ]

37] Even though as a rule, the PRV is expected to operate once in a while, sometimes, the PRV is operable in a hydraulic circuit. . [ ]

38] The above statement refers to on-off system of two fixed displacement pumps. [ ]

[39] Operating condition characterized by $\xi = \{(Wd)/ (Wd + WK)\}$ is not valid for the hydraulic presses since their system efficiency is greater than mechanical press [ ]

[40] One reason for increased effective pressure is due to number of elbow joints in the pipeline. [ ]

[41] Diameter of flywheel and clutch system is more in hydraulic clutches than the pneumatic clutches. [ ]

[42] Color code for pressure line is ……

[43] Color code for control pressure is …….

[44] Color code for feed line is ……..

[45] Color code for return line is ……

[46] Working stroke and dwell time are necessary to consider

……

46] Working stroke and dwell time are necessary to consider ……

[47] Drive stiffness in hydraulic press is lower due to compressibility of oil.

[ ]

[48] Eccentric forgings are not possible in hydraulic press. [ ]

[49] Direct driven hydraulic press is used in conjunction with shell extrusion.

[ ]

[50] Slide seizure is avoided since columns of the hydraulic presses are hollow forged.

[ ]

C. ON MECHANICAL PRESSES

1. There is no difference between Crank and Eccentric Presses as far as constructional features are concerned. [ ]
2. Vide question number 1 above, there is difference in variation of Slide Force against work path between the two mechanical presses. [ ]
3. Open back inclinable and inclined press can be inclined only up to 30^0 due dynamic stability. [ ]
4. Adiabatic heating of the job can be exploited in stroke bound press compared to hydraulic and screw presses. [ ]
5. Single stroking condition of stroke bound press can have utility factor of unity [ ]
6. Refer question 5. Such an utility factor is also valid for screw presses.[ ]
7. Non-Geared Stroke bound press is characterized by the motor drawing very high current during return play when utility factor is less than 0.25 [ ]
8. Stiffness of under drive stroke bound press is greater than over head drive. [ ]
9. Since losses vary as the square of the deformation force, stiffness of the drive system of the stroke bound press must be increased. [ ]
10. Flywheel diameter design in stroke bound press is influenced by permissible belt velocity. [ ]
11. Flywheel-Crank shaft key is designed based on the deformation work. [ ]
12. Flywheel dimensions also is dependent upon either pneumatic or hydraulic clutches employed. [ ]

13. Acceleration diagram of the connecting rod of a crank press enables failure analysis of the connecting rod. [ ]
14. Possibility exists in multiple point drive to compensate the end thrust components of forces. [ ]
15. Refer Q. 14. Such a feature enables cold backward extruding a can with excellent concentricity. [ ]
16. Knuckle joint press is preferred to eccentric press for coining. [ ]
17. Toggle joint mechanism is used for blank holding. [ ]
18. Lagging Crank shaft drive can be attuned for deep drawing of several engineering sheet metals by varying the punch velocity. [ ]
19. Hard motor is used for continuous stroking crank presses. [ ]
20. I_{XX} is made equal to $4I_{YY}$ in connecting rod design. [ ]
21. To account for avoiding buckling in XX, YY and ZZ directions, rolled dog bone structure is made use of on the press frame side. [ ]
22. Over shooting of punch can be avoided in a crank press, by pre-stressed tie rod and sleeve. [ ]
23. “O” type presses need not be pre-stressed with tie rod and sleeve. [ ]
24. Articulated Key-Spring Safety device has both flexibility for adjustment for force and is a non-destructive safety device. [ ]
25. It is better to keep the shear plate safety device visible in the press assembled with tools than incorporating inside the pitman joint. [ ]
26. Modern stroke bound presses operate with pneumatic clutches. [ ]
27. Clutch is an over load toque as well force protection safety device. [ ]
28. Press doubling is most likely in sliding bolt key clutch. [ ]
29. Danger Zone can be made with small gap between upper and lower tools. [ ]

30. All the safety devices ensure safety for both operators and press. [ ]

31. Trauma is a momentary black out of the operator. [ ]

32. Over a number of strokes, the shear plate safety device fails earlier than expected time. [ ]

33. It is justified to use the hydraulic safety device in multiple point drive mechanical press. [ ]

34. All the feeding devices ensure safety for both operators & press. [ ]

35. In the production of a piston pin in a mechanical press, iron hand is very essential for transferring the job. [ ]

36. Group technology concept is not possible in press working since heavy machines will have to be moved closer to each other. [ ]

34. Scallop is used to permit over sized part. [ ]

35. Silhouette is used to permit under sized part. [ ]

36. Wiper is used to knock out part climbing over another. [ ]

37. Roll over is used to avoid two parts clinging to each other. [ ]

38. All the above tools (Q.34 to 37) are mounted towards the entry point of the track of the vibratory bowl feeder. [ ]

39. Stretching of sheet is facilitated in draw in and draw out roll feeding device. [ ]

40. Refer Q.39. As a result, bending large radius for a thin sheet is hence facilitated. [ ]

41. Motor gets overloaded in a friction screw press, when deformation takes place. [ ]

42. In a basic three wheel press, the motor does not run under steady state condition. [ ]

43. Slip losses are minimal in a Vincent Friction Screw Press. [ ]

43. Braking energy is relieved in a four wheel friction screw press. [ ]

44. Drive slip losses are more in a direct driven percussion press. [ ]

45. Screw presses are ideal for coining operations. [ ]

46. Hydraulic wedge type screw press has a better overall efficiency under comparable operating conditions of **"ξ"** (of comparable screw presses).

[ ]

47. Stiffness in Screw Presses is intended to be lower than counter parts like hydraulic and stroke bound machines. [ ]

48. Refer Q. 47. Such a feature is addressed to jarring blow. [ ]

49. Motors of percussion presses do not run under steady state condition. [ ]

50. Hammerson variable ξ nearing unity ensures better overall efficiency both for soft and hard blow conditions of screw presses. [ ]

END OF PART I