MECHANICAL ENGINEERING

PAPER–II

1. Match List - I with List - II and select, the correct answer using the code given below the lists

List I (Application)

A. Boiler Shell
B. Marine Shaft Coupling
C. Crosshead and Piston Rod
D. Automobile gear box (gears to shaft)

List - II (Joint)

1. Cotter Joint
2. Knuckle Joint
3. Riveted joint
4. Splines
5. Bolted Joint

Codes;

	A	B	C	D
a.	1	4	2	5
b.	3	5	1	4
c.	1	5	2	4
d.	3	4	1	5

2. A single parallel fillet weld of total length L and weld size h subjected to a tensile load P, will have what design stress?

a. Tensile and equal to $\frac{p}{0.707Lh}$

b. Tensile and equal to $\frac{p}{Lh}$

c. Shear and equal to $\frac{p}{0.707Lh}$

d. Shear and equal to $\frac{p}{Lh}$

3. How can shock absorbing of a belt be increased?

a. By tightening it properly
b. By increasing the shank
c. By grinding the shank
d. By making the shank equal to the core diameter

4. How is the type of a railway wheel fitted?

a. By seam welding
b. By fillet welding
c. By interference fit
d. None of the above

5. Consider the following statements in case of belt drives:

1. Centrifugal tension in belt increases the transmitted
2. Centrifugal tension does affect the driving tension
3. Maximum tension in the belt is always three times the driving tension

Which of the statements given above is/are correct?

a. 1, 2 and 3
b. 2 and 3 only
c. 1 and 3 only
d. 1 only

6. The maximum efficiency of a screw jack having square threads with friction angle φ is:

a. $\frac{1-\tan(\varphi/2)}{1+\tan(\varphi/2)}$

b. $\frac{1-\tan\varphi}{1+\tan\varphi}$

c. $\frac{1-\sin\varphi}{1+\sin\varphi}$

d. $\frac{1-\sin(\varphi/2)}{1+\sin(\varphi/2)}$

7. In designing a shaft for variable loads, the S.N. diagram can be drawn by:

a. Joining the S_{ut} at 0 cycles and S_e at 10^6 cycles by a straight line on an S.N. graph
b. Joining the 0.9 S_{ut} at 1000 cycles and S_e at 10^6 cycles by a straight line on a log S — log N graph
c. Joining the 0.9 S_{ut} at 1000 cycles and S_e at 10^6 cycles by a straight line on an S.N. graph
d. Joining the S_{ut} at 1000 cycles and 0.9 S_e at 10^6 cycles by a straight line on a log S — log N graph

(S_{ut} stands for ultimate tensile strength and S_e for the endurance limit)

8. Match List - I with List - II and select the correct answer using the code given below the lists

List-I

A. Worm gear
B. Spur gear
C. Herringbone gear
D. Spiral level gear

List II

1. Imposes no thrust load on the shaft
2. To transmit power between two non-intersecting shafts which are perpendicular to each other
3. To transmit power when the shafts are parallel
4. To transmit power when the shafts are at right angles to one another

Codes;

	A	B	C	D
a.	1	2	3	4
b.	2	3	1	4
c.	1	2	4	3
d.	2	3	4	1

9. The velocity ratio between pinion and gear in a gear drive is 2.3, the module of teeth is 2.0 mm and sum of number of teeth on pinion and gear is 99. What is the centre distance between pinion and the gear?

a. 49.5 mm
b. 99 m
c. 148.5mm
d. 198 mm

10. Compared to gears with 200 pressure angle involutes full depth teeth, those with 200 pressure angle and stub teeth have

1. smaller addendum
2. smaller dedendum
3. smaller tooth thickness
4. greater bending strength

Which of the statements given above are correct?

a. 1, 2 and 3
b. 1, 2 and 4
c. 1, 3 and 4
d. 2, 3 and 4

11. A hollow shaft of outer dia 40 mm and inner dia of 20 mm is to be replaced by a solid shaft to transmit the same torque at the same maximum stress. What should be the diameter of the solid shaft?

a. 30 mm
b. 35 mm
c. $10 \times (60)^{1/3}$ mm
d. $10 \times (20)^{1/3}$ mm

12. Consider the following statements:

For a journal rotating in a bearing under film lubrication conditions, the frictional resistance is

1. proportional to the area of contact
2. proportional to the viscosity of lubricant
3. proportional to the speed of rotation
4. independent of the pressure

Which of the statements given above are correct?

a. 1, 2, 3 and 4
b. 1 and 4 only
c. 2, 3 and 4 only
d. 2 and 3 only

13. Increase in values of which of the following results in an increase of the coefficient of friction in a hydrodynamic bearing?

1. Viscosity of the oil.
2. Clearance between shaft and bearing.
3. Shaft speed

Select the correct answer• using thc code given below

a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. 1, 2 and 3

14. Average values of effective coefficients of friction for bearings are described below:

1. Spherical ball bearing — f_1
2. Cylindrical roller bearing — f_2
3. Taper roller bearing — f_3
4. Stable (thick film) sliding contact bearing — f_4

Which one of the following sequences is correct?

a. $f_1 < f_2 < f_3 < f_4$
b. $f_1 < f_2 < f_4 < f_3$
c. $f_2 < f_1 < f_3 < f_4$
d. $f_1 < f_4 < f_2 < f_3$

15. Which one of the following expresses the total elongation of a bar of length L with a constant cross-section of A and modulus of Elasticity E hanging vertically and subject to its own weight W?
    a. $\frac{WL}{AE}$
    b. $\frac{WL}{2AE}$
    c. $\frac{2WL}{AE}$
    d. $\frac{WL}{4AE}$

16. In a strained material one of the principal stresses is twice the other. The maximum shear stress in the same case is τ_{max}. Then, what is the value of the maximum principle stress?
    a. τ_{max}
    b. $2\tau_{max}$
    c. $4\tau_{max}$
    d. $8\tau_{max}$

17. For a general two dimensional stress system, what are the coordinates of the centre of Mohr's circle?
    a. $\frac{(\sigma_x - \sigma_y)}{2}, 0$
    b. $0, \frac{(\sigma_x + \sigma_y)}{2}$
    c. $\left(\frac{\sigma_x + \sigma_y}{2}\right), 0$
    d. $0, \frac{(\sigma_x - \sigma_y)}{2}$

18. If the ratio G/E (G = Rigidity modulus, E = Young's modulus of elasticity) is 0.4, then what is the value of the Poisson ratio?
    a. 0.20
    b. 0.25
    c. 0.30
    d. 0.33

19. What are the materials which show direction dependent properties, called?
    a. Homogeneous materials
    b. Viscoelastic materials
    c. Isotropic materials
    d. Anisotropic materials

20. What is the phenomenon of progressive extension of the material i.e., strain increasing with the time at a constant load, called?
    a. Plasticity
    b. Creeping
    c. Yielding
    d. Breaking

21. Which one of the following statements is correct?
    If a material expands freely due to heating, it will develop
    a. thermal stress
    b. tensile stress
    c. compressive stress
    d. no stress

22. A cantilever beam of 2 m length supports a triangularly distributed load over its entire length, the maximum of which is at the free end. The total load is 37.5 kN. What is the bending moment at the fixed end?
    a. 50×10^6 N mm
    b. 125×10^6 N mm
    c. 100×10^6 N mm
    d. 25×10^6 N mm

23. Which one of the following statements is correct?
    A beam is said to be of uniform strength, if
    a. the bending moment is the same throughout the beam
    b. the shear stress is the same throughout the beam
    c. the deflection is the same throughout the beam
    d. the bending stress is the same at every section along its longitudinal axis

24. Which one of the following statements is correct?
    When a rectangular section beam is loaded transversely along the length, shear stress develops on
    a. top fibre of rectangular beam
    b. middle fibre of rectangular beam
    c. bottom fibre of rectangular beam
    d. every horizontal plane

25. The diameter of a solid shaft is D. The inside and outside diameters of a hollow shaft of same material and length are $D/\sqrt{3}$ and $2D/\sqrt{3}$ respectively. What is

the ratio of the weight of the hollow shaft to that of the solid shaft?

a. 1 : 1
b. 1 : 4
c. 1 : 2
d. 1 : 3

26. Which one of the following statements is correct?

If a helical spring is halved in length, its spring stiffness

a. remains same
b. halves
c. doubles
d. triples

27. A solid circular shaft is subjected to a bending moment M and twisting moment T. What is the equivalent twisting moment Te which will produce the same maximum shear stress as the above combination?

a. M^2+T^2
b. $M+T$
c. $\sqrt{M^2+T^2}$
d. $M-T$

28. Consider the following statements:

In a thick walled cylindrical pressure vessel subjected to internal pressure, the tangential and radial stresses are

1. minimum at outer side.
2. minimum at inner side.
3. maximum at inner side & both reduce to zero at outer wall.
4. maximum at inner wall but the radial stress reduces to zero at outer wall.

Which of the statements given above is/are correct?

a. 1 and 2
b. 1 and 3
c. 1 and 4
d. 4 only

29. Match List - I with List -II and select the correct answer using the code given below the lists

List - I (Long Column)

A. Both ends hinged
B. One end fixed, and other end free
C. Both ends fixed
D. One end fixed, and other end hinged

List - II (Critical Load)

1. $\pi^2 EI/4l^2$
2. $4\pi^2 EI/l^2$
3. $2\pi^2 EI/l^2$
4. $\pi^2 EI/l^2$

Codes;

	A	B	C	D
a.	2	1	4	3
b.	4	1	2	3
c.	2	3	4	1
d.	4	3	2	1

30. Which one of the following is the correct ascending order of packing density for the given crystal structures of metals?

a. Simple cubic — Face centred cubic — Body centred cubic
b. Body centred cubic — Simple cubic — Face centred cubic
c. Simple cubic — Body centred cubic — Face centred cubic
d. Body centred cubic — Face centred cubic — Simple cubic

31. Vibration damping in machinery is best achieved by means of base structures made of which one of the following materials?

a. Low carbon steel
b. Nodular iron
c. Grey cast iron
d. White cast iron

32. For a Rhombohedral space lattice, which one of the following is correct?

a. $\alpha=\beta=\gamma=90°$
b. $\alpha=\beta=\gamma\neq 90°$
c. $\alpha=\gamma=90°\neq\beta$
d. $\alpha\neq\beta\neq\gamma\neq 90°$

33. Match List - I with List - II and select the correct answer using the code given below the lists:

List - I (Component)

A. Blades of bulldozer
B. Gas turbine blades
C. Drill bit
D. Springs of auto-mobiles

List -II (Required Property)

1. High wear resistance and high toughness
2. Low Young's modulus and high fatigue strength
3. High wear and abrasion resistance

4. High creep strength and good corrosion resistance

Codes;

	A	B	C	D
a.	3	2	1	4
b.	1	4	3	2
c.	3	4	1	2
d.	1	2	3	4

34. What is the approximate strain energy expression for a dislocation of unit length, irrespective of its edge or screw character?

a. $\frac{G^2b}{2}$

b. $\frac{Gb^2}{2}$

c. $\frac{G^2b}{4}$

d. $\frac{Gb^2}{4}$

35. What is the movement of block of atoms along certain crystallographic planes and directions, termed as?

a. Glide
b. Twinning
c. Slip
d. Jog

36. Which one of the following is the correct statement? Pearlite in iron-carbon system is a

a. phase consisting of ferrite and cementite at room temperature
b. mechanical mixture of ferrite and cementite at room temperature
c. eutectic mixture of ferrite and cementite at room temperature
d. All the above three are correct

37. Match List - I with List -II and select the correct answer using the code given below the Lists:

List - I (Name of the Invariant Reaction)

A. Monotectic
B. Eutectic
C. Eutectoid
D. Peritectic

List-II (Invariant Reaction During Cooling)

1. LIQUID $SOLID_1 + SOLID_2$
2. $LIQUID_1$ .... $LIQUID_2 + SOLID$
3. $SOLID_1$ .... $SOLID_1 + SOLID_2$
4. $LIQUID + SOLID_1$ .... $SOLID_2$

Codes;

	A	B	C	D
a.	3	2	1	4
b.	1	4	3	2
c.	3	4	1	2
d.	1	2	3	4

38. Which of the following factors influence hardness in a plain carbon steel?

1. Percentage carbon
2. Quenching media
3. Work size

Select the correct answer using the code given below:

a. 1 and 2 only
b. 2 and 3 only
c. 1 and 3 only
d. 1, 2 and 3

39. Match List - I with List -II and select the correct answer using the code given below the lists:

List - I (Material)

A. Fibre reinforced plastics
B. Acrylics
C. Phenolics
D. Butadiene rubber

List-II (Application)

1. Automobile tyres
2. Aircraft
3. Lenses
4. Electric switch cover

Codes

	A	B	C	D
a.	1	4	3	2
b.	2	3	4	1
c.	1	3	4	2
d.	2	4	3	1

40. Which one among the following is the most effective strengthening mechanism of non-ferrous metal?

a. Solid solution hardening
b. Strain hardening
c. Grain size refinement
d. Precipitation hardening

41. Wood is a natural composite consisting of which of the following?

a. Lignin fibres in collagen matrix

b. Lignin fibres in apatite matrix
c. Cellulose fibres in apatite matrix
d. Cellulose fibres in lignin matrix

42. Which one of the following is not a ceramic?
a. Alumina
b. Porcelain
c. Whisker
d. Pyrosil

43. Cutting tool material 18-4-1 HSS has which one of the following compositions?
a. 18% W, 4% Cr, 1% V
b. 18% Cr, 4% W, 1% V
c. 18% W, 4% Ni, 1% V
d. 18% Cr, 4% Ni, 1% V

44. Which one of the following elements/alloys exhibits season cracking?
a. Iron
b. Brass
c. Aluminium
d. Steel

45. Which metal forming process is used for manufacture of long steel wire?
a. Deep drawing
b. Forging
c. Drawing
d. Extrusion

46. Which one of the following is the correct statement?
a. Extrusion is used for the manufacture of seamless tubes
b. Extrusion is used for reducing the diameter of round bars and tubes by rotating dies which open and close rapidly on the work
c. Extrusion is used to improve fatigue resistance of the metal by setting up compressive stresses on. its surface
d. Extrusion comprises pressing the metal inside a chamber to force it out by high pressure through an orifice which is shaped to provide the desired form of the finished part

47. Which one of the following metals forming processes is not a high energy rate forming process?
a. Electro-magnetic forming
b. Roll-forming
c. Explosive forming
d. Electro-hydraulic forming

48. What are the advantages of powder metallurgy?
1. Extreme purity product
2. Low labour cost
3. Low equipment cost

Select the correct answer using the code given below
a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

49. Match List - I with List – II and select the correct answer using the code given below the lists

List - I (Casting Process)
A. Die casting
B. Investment casting.
C. Shell moulding
D. Centrifugal casting

List - II (Principle)
1. The metal solidifies in a rotating mould
2. The pattern cluster is repeatedly dipped into a ceramic slurry and dusted with refractory
3. Molten metal is forced by pressure into a metallic mould
4. After cooling, the invest is removed from the casting by pressure jetting or vibratory cleaning

Codes;

	A	B	C	D
a.	2	1	3	4
b.	3	4	2	1
c.	2	4	3	1
d.	3	1	2	4

50. Consider the following statements in respect of investment castings:
1. The pattern or patterns is/are not joined to a stalk or sprue also of wax to form a tree of patterns.
2. The prepared moulds are placed in an oven and heated gently to dry off the invest and melt out the bulk of wax.
3. The moulds are usually poured by placing the moulds in a vacuum chamber.

Which of the statements given above are correct?

a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. 1, 2 and 3

51. Which of the following are employed in shell moulding?

1. Resin binder
2. Metal pattern
3. Heating coils

Select the correct answer using the code given below

a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. 1, 2 and 3

52. Which one of the following is the correct statement?

In a centrifugal casting method

a. no core is used
b. core may be made of any metal
c. core is made of sand
d. core is made of ferrous metal

53. Which one of the following is the correct statement?

Gate is provided in moulds to

a. feed the casting at a constant rate
b. give passage to gases
c. compensate for shrinkage
d. avoid cavities

54. Consider the following statements in respect of oxy-acetylene welding:

1. The joint is not heated to a state of fusion.
2. No pressure is used.
3. Oxygen is stored in steel cylinder at a pressure of 14 MPa.
4. When there is an excess of acetylene used, there is a decided change in the appearance of flame.

Which of the statements given above are correct?

a. 1, 2 and 3
b. 2, 3 and 4
c. 1, 3 and 4
d. 1, 2 and 4

55. The coating material of an arc welding electrode contains which of the following?

1. Deoxidising agent
2. Arc stabilizing agent
3. Slag forming agent

Select the correct answer using the code given below

a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

56. In MIG welding, the metal is transferred into the form of which one of the following?

a. A fine spray of metal
b. Molten drops
c. Weld pool
d. Molecules

57. Consider the following statements in respect of the laser beam welding:

1. It can be used for welding any metal or their combinations because of very high temperature of the focal points.
2. Heat affected zone is very large because of quick heating.
3. High vacuum is required to carry the process.

Which of the statements given above is/are correct?

a. 1 and 2 only
b. 2 and 3 only
c. 1 only
d. 1, 2 and 3

58. Which of the following effects are possible due to residual stresses in welding?

1. Reduce dimensional stability
2. Weld cracking
3. Effect on fatigue strength
4. Reduction in the creep strength V

Select the correct answer using the code given below

a. 1 and 2 only
b. 2 and 3 only
c. 1 and 3 only
d. 1, 2, 3 and 4

59. During machining, excess metal is removed in the form of chip as in the case of turning Von a lathe. Which of the following are correct?

Continuous ribbon like chip is formed when turning

1. at a higher cutting speed
2. at a lower cutting speed 3. a brittle material
3. a ductile material

Select the correct answer using the code given below

a. 1 and 3
b. 1 and 4
c. 2 and 3
d. 2 and 4

60. Screw threads are produced on solid rods by using which of the following?

a. Dies
b. Punch
c. Mandrel
d. Boring bar

61. What is the process of removing metal by a milling cutter which is rotated against the direction of travel of the work piece, called?

a. Down milling
b. Up milling
c. End milling
d. Face milling

62. Which of the following methods are gear generating processes?

1. Gear shaping
2. Gear hobbing
3. Gear milling

Select the correct answer using the code given below

a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

63. Among the following machining processes, which can be used for machining flat surfaces?

1. Shaping
2. Milling
3. Broaching Select the correct answer using the code given below

a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. 1, 2 and 3

64. Honing Process gives surface finish of what order?

a. 10 μm (CLA)
b. 10 μm (CLA)
c. 01 μm (CLA)
d. 001 μm (CLA)

65. What are the main components of an NC machine?

1. Part program
2. Machine Control Unit
3. Servo meter

Select the' correct answer using the code given below

a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

66. Flank wear occurs mainly on which of the following?

a. Nose part and top face
b. Cutting edge only
c. Nose part, front relief face, and side relief face of the cutting tool
d. Face of the cutting tool at a short distance from the cutting edge

67. Which of the following are the mach inability criteria?

1. Tool life
2. Cutting forces
3. Surface finish

Select the correct answer using the code given below

a. 1, 2 and 3
b. 1 and 2 only
c. 1 and 3 only
d. 2 and 3 only

68. In strain gauge dynamometers, the use of how many active gauges makes the dynamometer more effective?

a. Four
b. Three
c. Two
d. One

69. For increasing the material removal rate in turning, without any constraints, what is the right sequence to adjust the cutting parameters?

1. Speed

2. Feed
3. Depth of cut

Select the correct answer using the code given below

a. 1—2—3
b. 2—3—1
c. 3—2—1
d. 1—3—2

70. Consider the following statements in relation to the unconventional machining processes:

1. Different forms of energy directly applied to work piece to have shape transformation or material removal from work surface.
2. Relative motion between the work and the tool is essential.
3. Cutting tool is not in physical contact with work piece.

Which of the statements given above are correct?

a. 1 and 2 only
b. 1, 2 and 3
c. 2 and 3 only
d. 1 and 3 only

71. According to the principle of location in jigs and fixtures, how many degrees of freedom are to be eliminated to have a body fixed in space?

a. 3
b. 4
c. 5
d. 6

72. Which one of the following is a clearance fit?

		+ 0015	-0.010
		+ 0005	+ 0.000
a.	Φ H 50	h 50	
		+0.010	-0025
		+0.000	+0.015
b.	Φ H 50	h 50	
		-0015	+0.025
		+ 0.000	+0.005
c.	Φ H 50	h 50	
		- 0010	+ 0030
		- 0000	+0.005
d.	Φ H 50	h 50	

73. What is the dominant direction of the tool marks or scratches in a surface texture having a directional quality called?

a. Primary texture
b. Secondary texture
c. Lay
d. Flaw

74. Which one of the following is not a purpose of long-term forecasting?

a. To plan for the new unit of production
b. To plan the long-term financial requirement
c. To make the proper arrangement for training the personnel
d. To decide the purchase programme

75. Consider the following statements relating to forecasting:

1. The time horizon to forecast depends upon where the product currently lies in its life cycle.
2. Opinion and judgmental forecasting methods sometimes incorporate statistical analysis.
3. In exponential smoothing, low values of smoothening constant, alpha result in more smoothing than higher values of alpha.

Which of the statements given above are correct?

a. 1, 2 and 3
b. 1 and 2 only
c. 1 and 3 only
d. 2 and 3 only

76. Consider the following statements:

Exponential smoothing

1. is a modification of moving average method
2. is a weighted average of past observations
3. assigns the highest weightage to the most recent observation
4. Which of the statements given above are correct?

a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

77. Consider the following statements:

Scheduling

1. is a general timetable of manufacturing.
2. is the time phase of loading.

3. is loading all the work in process on machines according to their capacity.

Which of the statements given above are correct?

a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

78. In an assembly line, what is the balance delay?

a. Line efficiency × 100
b. 100 - Line efficiency (in percentage)
c. $\frac{\text{Line efficiency}}{100}$
d. None of the above

79. If the fixed cost of the assets for a given period doubles, then how much will the break-even quantity become?

a. Half the original value
b. Same as the original value
c. Twice the original value
d. Four times the original value

80. Match List - I with List – II and select the correct answer using

List - I (Term)

A. Dummy activity
B. Critical path
C. PERT activity
D. Critical path method

List -II (Characteristics)

1. Follows β distribution
2. It is built on activity-oriented diagram
3. Constructed only to establish sequence
4. Has zero total slack

Codes;

	A	B	C	D
a.	3	4	1	2
b.	4	2	3	1
c.	3	4	2	1
d.	4	2	1	3

81. Consider the following statements:

PERT considers the following time estimates

1. Optimistic time
2. Pessimistic time
3. Most likely time

Which of the statements given above are correct?

a. 1, 2 and 3
b. 1 and 2 only
c. 3 only
d. 1 and 3 only

82. Which one of the following statements is not correct?

a. PERT is probabilistic and CPM is deterministic
b. In PERT, events are used and in CPM activities are used
c. In CPM, the probability to complete the project in a given time-duration is calculated
d. In CPM crashing is carried out

83. Which of the following are the benefits of inventory control?

1. Improvement in customer's relationship.
2. Economy in purchasing.
3. Elimination of the possibility of duplicate ordering.

Select the correct answer using the code given below

a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

84. Match List - I with List - II and select the correct answer using the code given below the lists :

List-I

A. Procurement cost
B. Carrying cost
C. Economic order quantity
D. Reorder point

List-II

1. Cost of holding materials
2. Cost of receiving order
3. Procurement lead time
4. Break-even analysis

Codes;

A	B	C	D

85. In the EOQ model, if the unit ordering cost is doubled, the EOQ

a. Is halved
b. Is doubled
c. Increases 1.414 times
d. Decreases 1.414 times

86. Consider the following statements:
1. In C language, both data and the function that operate on that data are combined into a single unit called object.
2. Almost every correct statement in C is also a correct statement in C++, although the reverse is not true.

Which of the statements given above is/are correct?
a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

87. The arithmetic expression 2.4**3.0 will be computed by the FORTRAN compiler as:
a. 2.4*2.4*2.4
b. $10^{3.0 \log} 10^{2.4}$
c. $e^{3.0} \log e^{2.4}$
d. 2.4*2.4*3.0

88. Which one of the following subroutines does a computer implementation of the simplex routine require?
a. Finding a root of a polynomial
b. Solving a system of linear equations
c. Finding the determinant of a matrix
d. Finding the eigen value of a matrix

89. Which one of the following is not the characteristic of acceptance sampling?
a. This is widely suitable in mass production
b. It causes less fatigue to inspectors
c. This is much economical
d. It gives definite assurance for the conformation of the specifications for all the pieces

90. If m is the number of constraints in a linear programming with two variables x and y and non-negativity constraints $x \geq 0$, $y \geq 0$; the feasible region in the graphical solution will be surrounded by how many lines?
a. m
b. m + 1
c. m + 2
d. m + 4

91. Which one of the following is the correct statement?

In the standard form of a linear programming problem, all constraints are
a. of less than or equal to, type
b. of greater than or equal to, type
c. in the form of equations
d. some constraints are of less than equal to, type and some of greater than equal to, type

92. Which one of the following causes the whirling of shafts?
a. Non-homogeneity of shaft material
b. Misalignment of bearings
c. Fluctuation of speed
d. Internal damping

93. In order for a transpiration matrix which has six rows and four columns, not to be degenerate, how much must be the number of allocated cells in the matrix?
a. 6
b. 9
c. 15
d. 24

94. Consider the following statements:

The assignment problem is seen to be the special case of the transportation problem in which

(The symbols have the usual meaning)
1. m = n
2. all ai = 1
3. $x_{ij} = 1$

Which of the statements given above are correct?
a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

95. If average arrival rate in a queue is 6/hr, and the average service rate is 10/hr, which one of the following is the average number of customers in the line, including the customer being served?
a. 03
b. 06
c. 12
d. 15

96. If the number of arrivals in a queue follows the Poisson distribution, then the inter arrival time obeys which one of the following distributions?
a. Poisson's distribution
b. Negative exponential law

c. Normal distribution
d. Binomial

97. Consider the following follower motions in respect of a given lift, speed of rotation and angle of stroke of a cam:
1. Cycloidal motion
2. Simple harmonic motion
3. Uniform velocity motion

Which one of the following is the correct sequence of the above in the descending order of maximum velocity?
a. 3—2—1
b. 1—2—3
c. 2—3—1
d. 3—1—2

98. If α = helix angle, and P_c = circular pitch; then which one of the following correctly expresses the axial pitch of a helical gear?
a. $p_c \cos\alpha$
b. $\frac{p_c}{\cos\alpha}$
c. $\frac{p_c}{\tan\alpha}$
d. $p_c \sin\alpha$

99. In a slider-bar mechanism, when does the connecting rod have zero angular velocity?
a. When crank angle = 0°
b. When crank angle = 90°
c. When crank angle = 45°
d. Never

100. The turning moment diagram for a single cylinder double acting steam engine consists of +ve and -ye loops above and below the average torque line. For the +ve loop, the ratio of the speeds of the flywheel at the beginning and the end is which one of the following?
a. Less than unity
b. Equal to unity
c. Greater than unity
d. Zero

101. Which one of the following is the correct statement?

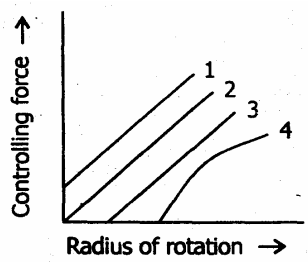
In meshing gears with involutes gear teeth, the contact begins at the intersection of the
a. line of action and the addendum circle of the driven gear
b. line of action and the pitch circle of the driven gear
c. dedendum circle of the driver gear and the addendum circle of the driven gear
d. addendum circle of the driver gear and the pitch circle of the driven gear

102. Interference between the teeth of two meshing involutes gears can be reduced or eliminated by:
1. increasing the addendum of the gear teeth and correspondingly reducing the addendum of the pinion.
2. reducing the pressure angle of the teeth of the meshing gears.
3. increasing the centre distance.

Which of the statements given above is/are correct?
a. 1 and 2
b. 2 and 3
c. 1 only
d. 3 only

103. What is the direction of the Coriolis component of acceleration in a slotted lever-crank mechanism?
a. Along the sliding velocity vector
b. Along the direction of the crank
c. Along a line rotated 900 from the sliding velocity vector in a direction opposite to the angular velocity of the slotted lever
d. Along a line rotated 90° from the sliding velocity vector in a direction same as that of the angular velocity of the slotted lever

104.

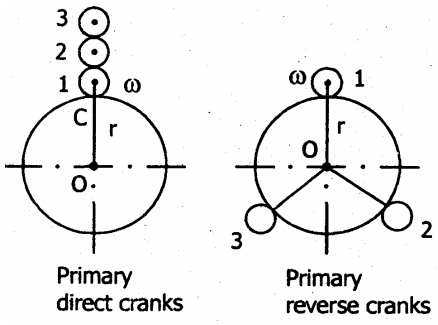


The controlling force curves for a spring-controlled governor are shown in the above figure. Which curve represents a stable governor?
a. 1
b. 2
c. 3
d. 4

105. For a governor running at constant speed, what is the value of the force acting on the sleeve?
   a. Zero
   b. Variable depending upon the load
   c. Maximum
   d. Minimum

106. What is the condition for dynamic balancing of a shaft-rotor system?
   a. $\Sigma M = 0$ and $\Sigma F = 0$
   b. $\Sigma M = 0$
   c. $\Sigma F = 0$
   d. $\Sigma M + \Sigma F = 0$

107.



(W = Weight of reciprocating parts per cylinder)

For a three-cylinder radial engine, the primary and direct reverse cranks are as shown in the above figures.

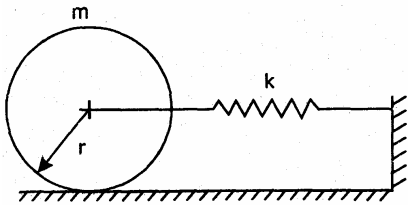
Which one of the following pairs is not correctly matched in this regard?

   a. Primary direct force … $\frac{3W}{2g}\omega^2.r$
   b. Primary reverse force … Zero
   c. Primary direct crank speed … ω
   d. Primary reverse crank speed …. 2ω

108. A uniform bar, fixed at one end carries a heavy concentrated mass at the other end. The system is executing longitudinal vibrations. The inertia of the bar may be taken into account by which one of the following portions of the mass of the bar at the free end?
   a. 5/384
   b. 1/48
   c. 33/140
   d. 1/3

109. A motion is aperiodic at what value of the damping factor?
   a. 1.0 or above
   b. 0.5
   c. 0.3
   d. 0.866

110.



A rolling disc of radius 'r' and mass 'm' is connected to one end of a linear spring of stiffness 'k', as shown in the above figure. The natural frequency of oscillation is given by which one of the following?

   a. $\omega = \sqrt{\frac{2}{3}\frac{k}{m}}$
   b. $\omega = \sqrt{\frac{k}{m}}$
   c. $\omega = \sqrt{\frac{k}{2m}}$
   d. $\omega = \sqrt{\frac{2k}{m}}$

111. In a 6 × 20 wire rope, No. 6 indicates the
   a. diameter of the wire rope in mm
   b. number of strands in the wire rope
   c. number of wires
   d. gauge number of the wire

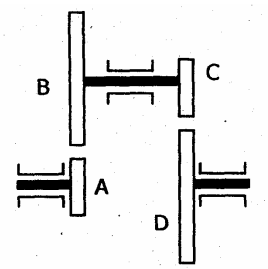
112. Which one of the following statements relating to belt drives is correct?
   a. The rotational speeds of the pulleys are directly proportional to their diameters
   b. The length of the crossed belt increases as the sum, of the diameters of the pulleys increases
   c. The crowning of the pulleys is done to make the drive sturdy
   d. The slip increases the velocity ratio

113. A force 'F' is to be transmitted through a square-threaded power screw into a nut. If 't' is the height of the nut and 'd' is the minor diameter, then which one of the following is the average shear stress over the screw thread ?
   a. $\frac{2F}{\pi dt}$
   b. $\frac{F}{\pi dt}$

c. $\frac{F}{2\pi dt}$

d. $\frac{4F}{\pi dt}$

114.



In the compound gear train shown in the above figure, gears A and C have equal numbers of teeth and gears B and D have equal numbers of teeth. When A rotates at 800 rpm, D rotates at 200 rpm. The rotational speed of compound gears BC would then be

a. 300 rpm
b. 400 rpm
c. 500 rpm
d. 600 rpm

115. Under service conditions involving jarring, vibration and pulsation of the working load, the bolt of choice would be a

a. short bolt with high rigidity
b. long bolt with increased elasticity
c. bolt with a dished washer
d. bolt with castle nut

116. Gearing contact is which one of the following?

a. Sliding contact
b. Sliding contact, only rolling at pitch point
c. Rolling contact
d. Rolling and sliding at each point of contact

117. Assertion (A): For drilling cast iron, the tool is provided with a point angle smaller than that required for a ductile material.

Reason (R): Smaller point angle results in lower rake angle.

a. Both A and R are individually true and R is the correct explanation of A.
b. Both A and R are individually true but R is not the correct explanation of A.
c. A is true but R is false
d. A is false but R is true

118. Assertion (A): Greater force on the plunger is required in case of direct extrusion than indirect one.

Reason (R): In case of direct extrusion, the direction of the force applied on the plunger and the direction of the movement of the extruded metal are the same.

a. Both A and R are individually true and R is the correct explanation of A.
b. Both A and R are individually true but R is not the correct explanation of A.
c. A is true but R is false
d. A is false but R is true

119. Assertion (A): In a multispindle automatic lathe, the turret tool holder is indexed to engage the cutting tools one by one for successive machining operations.

Reason (R): Turret is a multiple tool holder so that for successive machining operation, the tools needs not be changed.

a. Both A and R are individually true and R is the correct explanation of A.
b. Both A and R are individually true but R is not the correct explanation of A.
c. A is true but R is false
d. A is false but R is true

120. Assertion (A): Value engineering is a technique applied to compete in the market only at the time of introduction of a product or service.

Reason (R): Increasing the functional worth of a product appreciably, keeping the cost almost constant, is the real objective of value engineering.

a. Both A and R are individually true and R is the correct explanation of A.
b. Both A and R are individually true but R is not the correct explanation of A.
c. A is true but R is false
d. A is false but R is true