Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE COMREHENSIVE EXAMINATION(S), DECEMBER 2019

Course Code: ME352

Course name: COMPREHENSIVE EXAM

Max. Marks: 50 Duration: 1Hour

Instructions: ***(1) Each question carries one mark. No negative marks for wrong answers***
(2) Total number of questions: 50
(3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct.
(4) If more than one option is chosen, it will not be considered for valuation.
(5) Calculators are not permitted

PART A- COMMON COURSES

1. The sum of the series $\sum_{k=0}^{\infty}\left(\frac{1}{3}\right)^k$ is

   a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) $\frac{1}{2}$ d) 1

2. The solution of the differential equation $y'' - 4y' + 4y = 0$ is

   a) $y = (A + Bx)e^{2x}$ b) $y = (A + Bx)e^{-2x}$ c) $y = (A + Bx)e^{x}$ d) $y = (A + Bx)e^{-x}$

3. The resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is

   a) 120^0 b) 30^0 c) 90^0 d) 60^0

4. Two bodies of masses m_1 and m_2 are dropped from the top of a tower of same height. When these bodies reach the ground, their kinetic energies will be in the ratio

   a) 1 : 2 b) 1: √2 c) 1: 4 d) 1 : 1

5. The top view of a pentagonal prism with axis perpendicular to the vertical plane and parallel to horizontal plane will be a

   a) Pentagon b) Rectangle c) Trapezoid d) Straight line

6. In perspective projection the object is assumed to be kept on which of these planes.

   a) Picture plane b) Horizon plane c) Ground plane d) Central plane

7. Which is the most abundant element available in the atmosphere?

   a) Oxygen b) Nitrogen c) Argon d) Carbon di oxide

8. The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide

   a) Carbon Dating b) Carbon Trading c) Carbon Footprint d) Carbon Factor

9. One of the pins in a 3 pin plug top is bigger than the rest. This is most closely related to design for 'X', where 'X' is

a) Assembly b) Manufacturing c) Life cycle Cost d) Environment

10. Which of the following can be most appropriately associated with the design space of a ball?

a) Speed b) Velocity c) Diameter d) Height

PART B- CORE COURSES

11. Match plate pattern is used in

a) Green sand moulding b) Bench moulding c) Machine moulding d) Pit moulding

12. External screw threads can be produced fastest by

a) Rolling b) Milling c) Chasing d) Casting

13. Large size bolt heads are made by

a) Swaging b) Roll forging c) Tumbling d) Upset forging

14. Number of degrees of freedom of a work piece in space is equal to

a) 16 b) 10 c) 12 d) 14

15. What should be the appropriate thickness of the metal sheet when it is used as a raw material for the sheet metal operations?

a) 10mm to 60mm b) 7.5mm to 15mm c) 0.4 mm to 6mm d) 60mm to 100 mm

16. TIG welding is best suited for welding

a) Mild steel b) Stainless steel c) Aluminium d) Carbon steel

17. Impulse turbine is used for

a) low head b) high head c) medium head d) static head

18. A hydraulic turbine power of 8000 kW while running a speed of 100 rpm, under a head of 40 m. Find the specific speed of the turbine

a) 55 b) 88 c) 11 d) 22

19. Chances of occurrence of cavitation are high if the

a) the pressure falls below the vapour pressure b) the temperature becomes very low c) the Thomas cavitation parameter becomes high d) pressure becomes very high

20. If two identical pumps connected in series the resulting head is

a) 2H b) H c) 3H d) 4H

21. An ideal air compressor cycle with clearance volume on p-v diagram can be represented by the following processes

a) One adiabatic, two isobaric and one isochoric b) Two adiabatic and two isobaric c) One adiabatic, one isobaric and two isochoric d) Two isobaric and two isochoric

22. The compressor performance at higher altitude compared to sea level will be

a) Same b) Higher c) Lower d) Depend on other factors

23. Kinematics of machines deals with

a) Forces acting on parts of machine b) Relative motion between parts neglecting the consideration of the force c) Number of interrelated parts d) All of the above

24. In which of the following mechanisms Corioli's component exists?

a) Slider crank mechanism b) Scotch Yoke mechanism c) Double slider crank mechanism d) Oscillating cylinder mechanism

25. In a tangent cam and follower, base circle diameter is 60mm and follower diameter is 20mm.Cam rotates at 60^o when roller just leaves contact with the flank. The lift of the follower at this moment is

a) 40mm b) 60mm c) 80mm d) 20mm

26. Which of the following gear system have maximum axial thrust ?

a) Spur gear b) Helical gear c) Double helical gear d) Bevel gear

27. A gear box in an automobile uses

a) Simple gear train b) Compound gear train c) Epicyclic gear train d) Compound-epicyclic gear train

28. Dead center is that position of a mechanism in which the interior angle between coupler and follower links is

a) 0^o b) 90^o c) 180^o d) 270^o

29. For a process in which pV=C, work done is

a) zero b) p*(V2-V1) c) p1*V1*ln(V2/V1) d) none of the above

30. An air-conditioner provides 1 kg/s of air at 15°C cooled from outside atmospheric air at 35°C. Estimate the amount of power needed to operate the air-conditioner.

a) 1.09 kW b) 1.19 kW c) 1.29 kW d) 1.39 kW

31. Which of the following is known as the inequality of Clausius?

a) cyclic integral of dQ/T<=0 b) cyclic integral of dQ/T>=0 c) cyclic integral of dW/T<=0 d) cyclic integral of dW/T>=0

32. Which law is used for exergy balance?

a) first law b) second law c) first law and second law d) third law

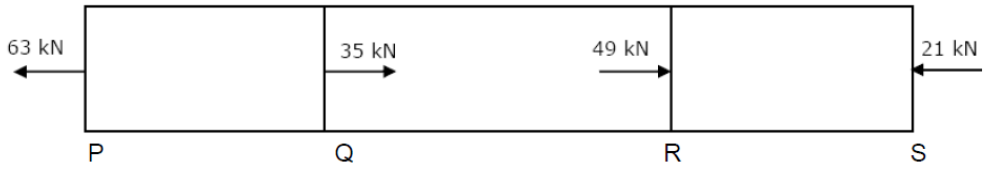
33. When gases which are at equal pressure and temperature are mixed adiabatically without work, then

a) internal energy of the gaseous system remains constant
b) heat transfer of the gaseous system remains constant
c) entropy of the gaseous system remains constant
d) all of the above

34. For a system which undergoes an infinitesimal reversible process between two equilibrium states, the change in internal energy is

a) dU = pdV – TdS
b) dU = TdS + pdV
c) dU = TdS – pdV
d) dU = -TdS – pdV

35. A bar having a cross-sectional area of 700 mm^2 is subjected to axial loads at the positions indicated. The value of stress in the segment QR is

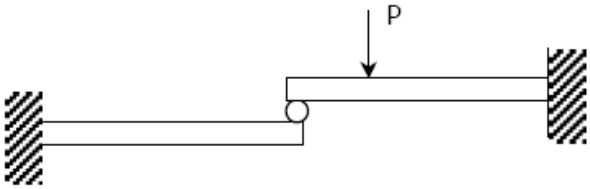


a) 40 MPa
b) 50 MPa
c) 60 MPa
d) 120 MPa

36. The total area under the stress-strain curve of a mild steel specimen tested up to failure under tension is a measure of

a) Ductility
b) Ultimate strength
c) Resilience
d) Toughness

37. Two identical cantilever beams are supported as shown, with their free ends in contact through a rigid roller. After the load P is applied, the free ends will have

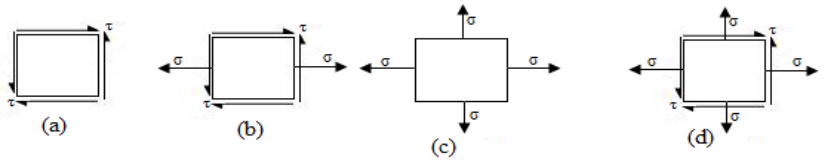


a) Equal deflections but not equal slopes
b) Equal slopes but not equal deflections
c) Equal slopes as well as equal deflections
d) Neither equal slopes nor equal deflections

38. On bending of a beam, which is the layer which is neither elongated nor shortened?

a) Axis of load
b) Neutral axis
c) Center of gravity
d) None of the above

39. For which one of the following two-dimensional states of stress will the Mohr's stress circle degenerate into a point?



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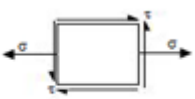
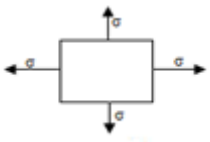
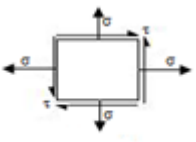
b) 
c) 
d) 

40. If a solid shaft can resist a bending moment of 3.0 kNm and a twisting moment of 4.0 kNm together, the maximum torque that can be applied is

a) 7.0 kNm
b) 3.5 kNm
c) 5.0 kNm
d) 6.0 kNm

41. Which of the following casting methods utilises wax pattern ?

a) Shell moulding b) Investment casting c) Plaster moulding d) Slush casting

42. The thickness of a metallic sheet is reduced from an initial value of 16 mm to a final value 10 mm in one single pass rolling with a pair of cylindrical rollers each of diameter 400 mm. The true strain is

a) 5.936 b) 7.936 c) 8.936 d) 9.936

43. The process used to make different designs on each side of work piece is

a) embossing b) heading c) piercing d) coining

44. The 3-2-1 principle of locating is also known as

a) Fool proofing b) Six point locating principle c) datum d) Zero point location principle

45. Which of the following forming processes is suitable for making utensils and cup shaped objects?

a) Forging b) Rolling c) Deep drawing d) Wire drawing

46. The method of joining metal surface by introducing a non ferrous alloy with melting point above 400° C is known as

a) Soldering b) Brazing c) Welding d) None of the above

47. Which of the following is an extensive property?

a) Surface tension b) Heat capacity c) Refractive index d) Viscosity

48. The crystal structure of brass is

a) BCC b) FCC c) HCP d) Mixture of all of the above

49. For pumping highly viscous fluids the type of pump generally used is

a) Centrifugal b) Multistage centrifugal c) Sliding vane d) Screw pump

50. If J = number of binary joints in the kinematic chain, H = number of higher kinematic pairs, L = number of links, The equation for criterion of constraint is given by,

a) $J + \frac{H}{2} = \frac{3}{2}L - 2$ b) $J + H = \frac{3}{2}L - 1$ c) $J + H = \frac{3}{2}(L - 1)$ d) $J + H = \frac{3}{2}(L + 1)$

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