Reg No.:_____            Name:_____

# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

**Course Code: ME352**
**Course Name: COMPREHENSIVE EXAM (ME)**

Max. Marks: 50                                       Duration: 1 Hour

**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*

1. The radius and height of a circular cone are measured with errors of at most 2% and 4% respectively. Find the maximum percentage error in the volume.

   (a) 4%       (b) 6%   (c) 8%         (d) 2%

2. If y=x is a solution of $x^2y^{II}+xy^{I}-y=0$ , then the second linearly independent solution is

   (a)$x^2$            (b)$x^{-1}$(c) $x^{-2}$         (d) $x^n$

3. What is the minimum velocity attained by a ball thrown with velocity of 20 m/s at an angle of $40^o$ with the horizontal?

   (a) 15.32 m/s   (b) 12.85 m/s  (c) 16.78 m/s        (d) None of the above

4. If a body in equilibrium condition is acted by three forces at three points, then the line of action of these forces should be _____

   (a) always concurrent       (b) always parallel

   (c) concurrent or parallel      (d) none of the above

5. Pencils used for engineering drawing work are?

   (a) 2B to HB         (b) 3H to 6H(c) 4B to 6H          (d) HB to 2H

6. The title block is made on the drawing sheet at the

   (a) upper left corner    (b) lower left corner(c) upper right corner    (d) lower right corner

7. Which ISO standard corresponds to Environmental management systems?

   (a)ISO 9001          (b) ISO 14001  (c) ISO 22000        (d) ISO 18001

8. Which *one* of the following gases is not included in the category 'greenhouse gases'?

   (a)Hydrogen          (b) Methane    (c) Carbon dioxide    (d) Nitrous oxide

9. Identify the design constrains of a ladder from the following.

   (a)It is the selling price of the product         (b)It must have good stability

(c)It must have good look           (d)The cost of ladder should not exceed Rs 500

10   Ergonomics of design means

(a)Efficiency of the product           (b)Convenience of using the product

(c)Outlook of the product           (d)Weight of the product

11   A solid bar of circular cross section of diameter d has a hole of diameter d/4 drilled laterally through the centre of the bar. The allowable average tensile stress on the net cross section of the bar is $\sigma_{allow}$ . The allowable load on the net cross section of the bar is

(a) $0.27d^2 x\ \sigma_{allow}$      (b) $0.54dx\ \sigma_{allow}$      (c) $0.675d^2 x\ \sigma_{allow}$      (d) $0.54d^2 x\ \sigma_{allow}$

12   An element in plane stress is subjected to $\sigma_x$=3100 kPa, $\sigma_y$=8700 kPa and $\tau_{xy}$=-4500 kPa. The maximum shear stress is

(a) $\tau_{max}$ = 5300 kPa      (b) $\tau_{max}$ =- 5300 kPa   (c) $\tau_{max}$ = 8300 kPa      (d) $\tau_{max}$ = 5800 kPa

13   A material is said to be isotropic if the material property is

(a)Same in all directions and same at all points   (b) Same in all directions

(c) Same in perpendicular directions           (d) Same at all points

14   A 15 mm diameter rod is subjected to a 3.5 kN axial tensile force. An elongation of 11 mm and a decrease of 0.62 mm are observed in a 120 mm gage length. The Poisson's ratio and Modulus of rigidity of the material respectively are

(a) 0.15, 93.125 MPa   (b) 0.9, 36.75 MPa     (c) 0.6, 55.8 MPa      (d) 0.45, 74.5 MPa

15   The torque that can be applied to a solid shaft of 90 mm diameter without exceeding an allowable shear stress of 75 MPa is

(a) 21.6 kN m      (b) 16.3 kN m    (c) 10.8 kN m           (d) 5, 4 kN m

16   The bending moment on the section of a beam is maximum where the shear force is

(a) Zero           (b) Zero or Minimum (c) Changing sign           (d) Infinity

17   A cantilever beam of length 2 m and M I $7.2 \times 10^5 mm^4$ fails when subjected to a load of 2 kN at its free end. The stress at the point of failure is

(a)205.3 $N/mm^2$      (b) 196.8 $N/mm^2$ (c) 146.67 $N/mm^2$      (d) 166.67 $N/mm^2$

18   In an open system, for maximum work, the process must be entirely

(a) irreversible      (b)reversible         (c) adiabatic           (d) none of the mentioned

19   In a constant volume process, internal energy change is equal to

(a)zero         (b) work done    (c) heat transferred     (d) none of the mentioned

20  Efficiency of a heat engine is defined as

(a) total heat output / net work input   (b) total heat input / net work output

(c) net work output / total heat input   (d) net work input / total heat output

21  When humidity ratio of air _____ air is said to be dehumidified.

(a) decreases                    (b) increases

(c) remains constant             (d) none of the mentioned

22  The work done by a closed system in a reversible process is always ___ that done in an irreversible process.

(a) less than or more than   (b) equal to     (c) less than   (d) more than.

23  The value of universal gas constant is

(a) 8.5123         (b) 8.3143(c) 8.2353                (d) none of the mentioned

24  The temperature on Celsius is 30ºC. What is the corresponding temperature on the Fahrenheit scale?

(a) 80º F               (b) 75º F(c) 86º F                    (d) 76º F

25  The materials in which atoms are arranged regularly in some directions are called

(a) Single crystal      (b) Crystalline material(c) Amorphous materials      (d) All of these

26  Brass is an example of

(a) Substitutional solid solution        (b) Interstial solid solution

(c) Intermettalic compound               (d) All of the above

27  BCC structure is found in

(a) Zinc, magnesium, cobalt, cadmium, antimony, bismuth

(b) Gamma iron, aluminium, copper, lead, silver, nickel

(c) Alpha iron, tungsten, chromium, molybdenum

(d) None of the above

28  Which of the following element results in presence of free graphite in cast iron?

(a) Carbon            b) Silicon      (c) Sulphur            d) Manganese

29  The ability of a material to absorb energy in the plastic range is called

(a) Plasticity          (b) Toughness    (c) Hardness            (d) Yield strength

30  The coordination number of a FCC structure

(a) six                  (b) eight            (c) twelve              (d) four

31  The unit speed of the turbine runner is

(a) $N/\sqrt{H}$            (b) N/H      (c) N/H3/2          (d) N/H²

32  Motion of a liquid in a volute casing of a centrifugal pump is an example of

(a) Rotational flow     (b) Radial    (c) Forced spiral vortex flow     (d) Spiral vortex flow

33  High specific speed of a pump implies it is

(a) Centrifugal pump            (b) Mixed flow pump

(c) Axial flow pump             (d) Any one of the above

34  In order to avoid cavitation in centrifugal pumps

(a) The suction pressure should be high    (b) The delivery pressure should be high

(c) The suction pressure should be low     (d) The delivery pressure should be low

35  Impulse turbine is generally fitted

(a) At the level of tail race                (b) Slightly below the tail race

(c) About 2.5 m above the tail race         (d) Little above the tail race

36  Kinematic similarity is said to exist between the model and the prototype, if both of them

(a) Have identical velocities                        (b) Are equal in size and shape

(c) Are identical in shape, but differ only in size     (d) Have identical forces

37  The flow ratio of Francis turbine is defined as the ratio of the

(a) Velocity of runner at inlet to the velocity of flow at inlet

(b) Velocity of flow at inlet to the theoretical jet velocity

(c) Theoretical velocity of jet to the velocity of flow at inlet

(d) None of the above

38  Which of the following articles cannot be made from rolling?

(a) rails                (b) helmets            (c) bars                (d) plates

39  Extrusion is a process of

(a) Pushing the heated billet of metal through an orifice

(b) Producing a hole by a punch

(c) Making cup shaped parts from the sheet metal

(d) None of the above

40  In circular drawing process, when the depth of drawing is more than the diameter of the die, then the process is called as
(a) forced drawing      (b) hollow drawing(c) deep drawing  (d) all of the above

41  An example of fusion welding is
(a) arc welding     (b) gas welding      (c) thermit welding          (d) None of the above

42  In gas welding, which flame the ratio of oxygen is deficient?
(a) Carburizing flame            (b) Oxidizing flame

(c) Neutral flame              (d) none of the mentioned

43  What does HAZ stand for?

(a) Helium Aerated Zone        (b) Heat Affected Zone

(c) Heated Area Zone           (d) Heat Allowed Zone

44  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

45  Which motion of follower is best for high speed cams?

(a) SHM follower motion

(b) Uniform acceleration and retardation of follower motion

(c) Cycloidal motion follower

(d) all of the above

46  Negative acceleration is termed as

(a) ceasing     (b) retardation       (c) inertia            (d) opposite velocity

47  The size of a gear is usually specified by

(a) pressure angle             (b) circular pitch

(c) diametral pitch            (d) pitch circle diameter

48  Driving gear of two mating gear which is generally small is known as

(a) Rack        (b) Pitch line        (c) Pinion          (d) Line of centre

49  Which of the following statements is not correct?

a) Hooke's joint is used to connect two rotating co-planar, non-intersecting shafts

b) Hooke's joint is used to connect two rotating co-planar, intersecting shafts

c) Oldham's coupling is used to connect two parallel rotating shafts

d) Hooke's joint is used in the steering mechanism for automobiles

50  Which type of gear box is used in automobiles?

(a) Sliding mesh gear box                (b) Differential gear box

(c) Synchromesh gear box                 (d) All of the above

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