Maximum : 100 marks

Time : 1 hour and 15 minutes

1. The concept of TQM nears to :
   (A) No scrap/rejected products
   (B) Total Quality of Man
   (C) Total Quality of Method
   (D) Total Quality of Machine

2. In a Critical path, slack is equal to :
   (A) Project time
   (B) Minimum project time
   (C) Maximum project time
   (D) Zero

3. Which of the following statements is true for the term Break Even Point analysis?
   (A) It calculates the profit at B. E. P.
   (B) Net revenue at B.E.P is calculated for calculating profit %
   (C) It calculates the volume of output at which neither loss nor profit occurs
   (D) It is used to forecast the net sales with 10% profit

4. Which of the following techniques in quality control helps to keep the number of defects or imperfections per unit of product?
   (A) X chart
   (B) C chart
   (C) R chart
   (D) P chart

5. Which of the following terms is most appropriate to describe the basic elements of movements or fundamental hand motions of the work cycle?
   (A) Work study
   (B) Tool study
   (C) Therbligs
   (D) Macroscopic motion study

6. Thermal power stations are located near :
   (A) Rivers/ oceans
   (B) Collieries
   (C) Metro cities
   (D) Wet, fertile land

7. Which of the following deals with the comfort of human body to get the maximum output and minimum strain?
   (A) Physiology
   (B) Psychology
   (C) Economics
   (D) Ergonomics

8. In a plane turning operation, if L= Length to be turned (mm) ; S_r = feed (mm/rev); N = r.p.m of work piece; D= diameter of work (m) ; V= cutting speed (m/min), then the time for turning is equal to :

(A) $L/(S_r \times N)$ in seconds
(B) $L/(S_r \times N)$ in minutes
(C) $(L \times D)/(S_r \times N)$ in seconds
(D) $(L \times D)/(S_r \times N)$ in minutes

9. The structure of Gamma Iron formed between 910°C and 1400°C is :

(A) BCC
(B) FCC
(C) HCP
(D) None of the above

10. Purest form of iron is :

(A) Pig iron
(B) Cast iron
(C) Wrought iron
(D) Puddled iron

11. In which of the following welding techniques a separate electrode is used to maintain the electric arc which should not touch the work/ filler material?

(A) Manual metal arc welding
(B) Submerged arc welding
(C) MIG
(D) TIG

12. In a vernier caliper, 50 divisions on the vernier scale is equal to 49 divisions of the main scale. Each division on the main scale is 0.5 mm. Then the least count in mm is :

(A) 0.01
(B) 0.10
(C) 0.02
(D) 0.20

13. Which of the following tool materials is the hardest, next to diamond?

(A) Tungsten carbide
(B) CBN (Cubic Boron Nitride)
(C) Ceramics
(D) Titanium carbide

14. Which of the following is the most preferred bond type in a grinding wheel for grinding glass components?

(A) Rubber
(B) Vitrified
(C) Silicate
(D) Shellac

15. In Flexible Manufacturing System :

(A) Machines are flexible
(B) Cutting tools are flexible
(C) Machines as well as cutting tools are flexible
(D) Work- machine schedule is flexible during production

16. Which of the following is true when the rake angle of a cutting edge increases?

(A) Tool strength reduces and chip flow resistance increases

(B) Tool strength increases and smooth chip flow

(C) Tool strength reduces and chip flow resistance reduces

(D) Tool strength increases and chip flow resistance increases

17. Speed of air craft can be measured by

(A) Tachometer

(B) Pressure gauge

(C) Pitot tube

(D) Ultrasonic flow meter

18. Which of the following senses the elastic deformation of a hollow tube with elliptical cross section and bent in the form of an arc during the pressure measurement ?

(A) Piezometer tube

(B) Bourdon's tube pressure gauge

(C) U-tube manometer

(D) Differential manometer

19. Unit of specific weight in S.I. system is :

(A) kg/litre

(B) kg/m^3

(C) $kgwt/m^3$

(D) N/m^3

20. Cavitation in centrifugal pump results in :

(A) Damage of impellor due to pitting

(B) Highest possible efficiency

(C) Increasing fluid temperature

(D) Increasing fluid pressure

21. Head loss in meters of fluid column, due to fluid friction, during a flow through a pipe under pressure, can be found by :

(A) $mr\omega^2$ {not go be printed ω – is Greek letter '*omega*'}

(B) ρgd {not go be printed ρ – is Greek letter '*rho*'}

(C) $1/2mv^2$

(D) $4flv^2/(2gd)$

22. A multi stage centrifugal pump can be practically employed to suck water from a maximum depth of approximately :

(A) 8 m

(B) 20 m

(C) 40 m

(D) 60 m

23. A centrifugal pump is operated through a V belt drive by a 3 phase induction motor. Pump efficiency is 50 %, transmission loss is 10 % and motor efficiency is 80 %. Electrical power needed to operate the pump when producing 3.6 kW hydraulic power output is :

(A) 4.5 kW
(B) 7.2 kW
(C) 10 kW
(D) 18 kW

24. Pressure inside the Pelton wheel turbine casing is

(A) less than atmospheric
(B) atmospheric
(C) greater than atmospheric
(D) the penstock pressure

25. Maximum deflection of a cantilever beam with point load 'P' at free end is :

(A) $(PL^3)/(3EI)$ at fixed end
(B) $(PL^3)/(3EI)$ at free end
(C) $(PL^4)/(8EI)$ at free end
(D) $(PL^4)/(32EI)$ at free end

26. Simple theory of elastic bending (with usual notations) is :

(A) $M/I = f/Y = E/R$
(B) $M/I = Y/f = E/R$
(C) $I/M = Y/f = E/R$
(D) $I/M = f/Y = E/R$

27. During bending of an elastic material, the neutral axis passes through

(A) Bottom most layer of section
(B) Top most layer of section
(C) Centroid of the section
(D) None of the above

28. Area moment of inertia of a square cross section with side B is :

(A) $(B^3)/8$
(B) $(B^3)/12$
(C) $(B^4)/8$
(D) $(B^4)/12$

29. Ratio of stress to strain is :

(A) % of strain
(B) % of stress
(C) Poisson's ratio
(D) Modulus of elasticity

30. Thread height (H) of ISO screw thread is related to its pitch (P) by

(A) $H = 0.500P$
(B) $H = 0.960P$
(C) $H = 0.866P$
(D) $H = 1.732P$

31. Which of the following operations will produce the lowest surface roughness?

(A) Milling
(B) Lapping
(C) Grinding
(D) Reaming

32. In the Hole basis system which one of the following represents a press fit?

(A) H7 p6
(B) H7 h7
(C) H7 f7
(D) H7 g6

33. Which of the following is true in the case of a diesel engine?

(A) Indicated thermal efficiency is always lower than the brake thermal efficiency
(B) Indicated thermal efficiency does not increase as brake power increases
(C) Indicated thermal efficiency always decreases as output power increases
(D) Indicated thermal efficiency cannot be zero

34. Characteristic difference of Diesel Cycle from Auto Cycle is by :

(A) Isochoric heat addition
(B) Isobaric heat addition
(C) Isothermal heat addition
(D) Isentropic heat addition

35. Source and Sink temperatures of a Carnot Engine are 27°C and 927°C respectively. The efficiency of Carnot Engine can be :

(A) 29 %
(B) 50 %
(C) 75 %
(D) 100 %

36. In the area of radiation heat transfer, white paper material is assumed to be a

(A) Black body
(B) White body
(C) Grey body
(D) Green body

37. Unit of Overall Heat Transfer Coefficient is :

(A) W/m^2K
(B) W/mK
(C) W/K
(D) W/m

38. One Ton of Refrigeration (1 TR) is :

(A) 50.4 kW thermal
(B) 3.517 kW thermal
(C) 211 kW thermal
(D) 3.876 kW thermal

39. Thermostatic Expansion valve operates on the :

(A) Temperature of refrigerant coming out of evaporator
(B) Pressure of refrigerant coming out of evaporator
(C) Volume of refrigerant coming out of evaporator
(D) Degree of Superheat of refrigerant coming out of evaporator

40. Which of the following can produce a fog in atmosphere?

(A) Sensible cooling up to saturation
(B) Sensible heating
(C) Mixing of air streams
(D) Dehumidification

41. If $A=\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}$ find 2A :

(A) $\begin{pmatrix}-2 & 4\\ 6 & 8\end{pmatrix}$

(B) $\begin{pmatrix}1 & 4\\ 9 & 6\end{pmatrix}$

(C) $\begin{pmatrix}2 & 4\\ 6 & 8\end{pmatrix}$

(D) $\begin{pmatrix}7 & 10\\ 15 & 22\end{pmatrix}$

42. Evaluate $\begin{vmatrix}\sin\theta & \cos\theta\\ -\cos\theta & \sin\theta\end{vmatrix}$:

(A) $\sin^2\theta-\cos^2\theta$

(B) 1

(C) -1

(D) ∞

43. Which of the following matrices is singular?

(A) $\begin{pmatrix}2 & -2\\ 3 & 3\end{pmatrix}$

(B) $\begin{pmatrix}5 & -1\\ 0 & 5\end{pmatrix}$

(C) $\begin{pmatrix}2 & 3\\ 2 & 3\end{pmatrix}$

(D) $\begin{pmatrix}4 & 3\\ 2 & 1\end{pmatrix}$

44. Find 'k' if the system is consistent :

$x+y+1=0,\ x+2y+1=0,\ 2x+3y+k=0$

(A) 2

(B) -2

(C) 4

(D) 3

45. Find the inverse of the matrix $\begin{pmatrix}5 & 3\\ 2 & 2\end{pmatrix}$:

(A) $\frac{1}{4}\begin{pmatrix}2 & -3\\ -2 & 5\end{pmatrix}$

(B) $\begin{pmatrix}2 & -3\\ -2 & 5\end{pmatrix}$

(C) $\frac{1}{4}\begin{pmatrix}5 & 2\\ 3 & -2\end{pmatrix}$

(D) $\begin{pmatrix}\frac{5}{4} & 2\\ \frac{3}{4} & -2\end{pmatrix}$

46. If $nC_{12}=nC_8$, find 'n' :

(A) 18

(B) 4

(C) 8

(D) 20

47. Evaluate $\tan^2 60^\circ+3\tan^2 45^\circ$:

(A) 3

(B) 4

(C) 6

(D) 5

48. If $\tan A = 2$, $\tan B = 1$, find $\tan(A - B)$:

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{1}{4}$ (D) 0

49. Find the area of the ΔABC, given $b = 3cm$, $c = 2cm$, $A = 30°$:

(A) $\frac{5}{2} sq.cm$ (B) $\frac{1}{2} sq.cm$

(C) $-1 sq.cm$ (D) $\frac{3}{2} sq.cm$

50. Find the equation of a line parallel to $2x - 3y + 1 = 0$ and passing through (1,1) :

(A) $3x + 2y - 5 = 0$ (B) $2x - 3y + 1 = 0$

(C) $-3x + 2y + 5 = 0$ (D) $2x + 3y - 1 = 0$

51. Find the equation of the line with X–intercept 5 and passing through the point (–1,2) :

(A) $x - 3y = 5$ (B) $3x + y = 5$

(C) $x + 3y = 5$ (D) $\frac{x}{5} + \frac{5y}{3} = 1$

52. Evaluate $\lim_{x \to 3} \frac{5x+1}{x+1}$:

(A) 5 (B) 15

(C) 1 (D) 4

53. Find 'λ' if $f(x) = \begin{cases} x+2, & \text{if } x \neq 1 \\ \lambda, & \text{if } x = 1 \end{cases}$ is continuous at $x = 1$:

(A) 3 (B) 2

(C) 1 (D) –3

54. If $y = \frac{1}{\sec\sqrt{x}}$ find $\frac{dy}{dx}$:

(A) $\sec\sqrt{x} \tan\sqrt{x}$ (B) $\frac{-\sin\sqrt{x}}{2\sqrt{x}}$

(C) $\frac{\sin\sqrt{x}}{2\sqrt{x}}$ (D) $\cos\sqrt{x}$

55. Find $\frac{dy}{dx}$ if $y = x^2 \sin x$:

(A) $x^2 \cos x + 2x \sin x$ (B) $2x \cos x + \sin x$

(C) $x^2 \cos x + 2 \sin x$ (D) $x^2 \sin x + 2x \cos x$

56. Find $\int(\sec^2 x + e^x - 5)dx$:

(A) $\tan x + e^x - 5 + c$ (B) $\cot x + e^x - 5x + c$

(C) $\tan x + e^x - 5x + c$ (D) $\sec x + e^x - 5x + c$

57. Evaluate $\int_0^\infty \frac{dx}{1+x^2}$:

(A) 0 (B) ∞

(C) 1 (D) $\frac{\pi}{2}$

58. Find $\int \frac{2x^4}{1+x^{10}}dx$:

(A) $2/5\tan^{-1}(x^5)+c$ (B) $2\tan^{-1}(x^5)+c$

(C) $\frac{2}{5}\sin^{-1}(x^5)+c$ (D) $2\cot^{-1}(x^{10})+c$

59. Find the area enclosed between the curve $x = y^2 - 2y$, the y-axis and the ordinate at $y = 1$ and $y = 2$:

(A) $\frac{4}{3}$ sq. units (B) $\frac{5}{3}$ sq. units

(C) $\frac{4}{3}\pi$ sq. units (D) $\frac{2}{3}$ sq. units

60. Solve $\frac{dy}{dx} + y\tan x = \cos^2 x$:

(A) $y\cos x = \sin x + c$ (B) $y\sec x = \sin x + c$

(C) $y = \sin x + c$ (D) $y\sec x = x + c$

61. An example for a tribasic acid :

(A) Sulphuric acid (B) Oxalic acid

(C) Phosphoric acid (D) Acetic acid

62. The process of separating crude oil into various fractions :

(A) Reforming (B) Refining

(C) Cracking (D) Knocking

63. The monomer of Nylon 6 is :

(A) Caprolactum

(B) Adipic acid and Hexamethylene diamine

(C) Styrene

(D) Dicyanide