



ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ ਜਲੰਧਰ

PUNJAB TECHNICAL UNIVERSITY JALANDHAR

Max. Marks: 90

Time: 90 Mins.

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions

- Fill all the information in various columns, in capital letters, with blue/black ball point pen.
- Use of calculators is not allowed.
- All questions are compulsory. No negative marking for wrong answers.
- Each question has only one right answer.
- Questions attempted with two or more options/answers will not be evaluated.

Stream (Engg./Arch./Pharm./Mgmt./App.Sci./Life Sci.)

ENGINEERING

Discipline / Branch

Mechanical Engineering

Name

Father's Name

Roll No.

Date

Signature of Candidate

Signature of Invigilator

Q. 1 Tool life of the cutting tool is most affected by

- a) Cutting speed
- b) Tool geometry
- c) Cutting feed and depth
- d) Microstructure of material being cut

Q. 2 Metal in machining operation is removed by

- a) Tearing chips
- b) Shearing the metal across a zone
- c) Distortion of metal
- d) Cutting the metal across a zone

Q. 3 Pick the composite from the list

- a) Steel
- b) Nylon
- c) Mica
- d) Wood

Q. 4 Strong and ductile materials

- a) Polymers
- b) Ceramics

c) Metals

d) Semiconductors

Q. 5 True stress-strain curve need to be corrected after

- a) Elastic limit
- b) Yield limit
- c) Tensile strength
- d) No need to correct

Q. 6 The units for diffusivity, D , are

- a) $m^2 \sec^{-1}$
- b) $m^2 \sec^{-1}$
- c) $m^2 \sec^{-1}$
- d) $m^2 \sec^{-1}$

Q. 7 The most influencing factor of diffusivity

- a) Diffusing species
- b) Temperature
- c) Lattice structure

- d) Presence of defects
- Q. 8 wt.% of carbon in mild steels
- <0.008
 - 0.008-0.3
 - 0.3-0.8
 - 0.8-2.11
- Q. 9 Eutectic product in Fe-C system is called
- Pearlite
 - Bainite
 - Ledeburite
 - Spheroidite
- Q. 10 Eutectoid product in Fe-C system is called
- Pearlite
 - Bainite
 - Ledeburite
 - Spheroidite
- Q. 11 Time dependent yield is known as
- Fracture
 - Fatigue
 - Buckling
 - Creep
- Q. 12 Fracture toughness, decreases with
- increasing temperature
 - increasing strain rate
 - increase in yield strength
 - increase in grain size
- Q. 13 ABC analysis is based upon the principle that
- all items in inventory must be monitored very closely
 - there are usually a few critical items, and many items which are less critical
 - an item is critical if its usage is high
- d) the safety stock in terms of volume should be higher for A items than for C items
- Q. 14 Most often machine components fail by
- Buckling
 - Creep
 - Fatigue
 - All above
- Q. 15 Stainless steel is so called because of its _____.
- High strength
 - High corrosion resistance
 - High ductility
 - Brittleness
- Q. 16 Usual casting method for making dental crowns
- Sand casting
 - Die casting
 - Continuous casting
 - Investment casting
- Q. 17 Al-alloys for engine/automobile parts are reinforced to increase their
- Strength
 - Wear resistance
 - Elastic modulus
 - Density
- Q. 18 Units for thermal conductivity
- J/kg.K
 - J/mol.K
 - J.ohm/sec.K²
 - W/m.K
- Q. 19 Metals are _____.
- Transparent
 - Opaque
 - Translucent

d) None of the above

Q. 20 Usually _____ is the initial stage of a component manufacturing.

- a) Design
- b) Conception
- c) Material selection
- d) Testing

Q. 21 Given that 1 is an eigen value of

$A = \begin{pmatrix} 2 & 5 & -6 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$; other two eigen values are:

- a) 2 and -3
- b) 2 and 0
- c) -2 and 3
- d) 2 and -2

Q. 22 The two types of errors that are related to differentials are:

- a) Human, Absolute.
- b) Absolute, Relative.
- c) Relative, Controllable.
- d) Controllable, Natural.

Q. 23 Mathematically, what is a differential?

- a) A gear box on the back end of your car.
- b) A word used a lot on a popular medical television series.
- c) A method of directly relating how changes in an independent variable affect changes in a dependent variable.
- d) A method of directly relating how changes in a dependent variable affect changes in an independent variable.

Q. 24 A partial differential equation requires

- a) Exactly one independent variable
- b) Two or more independent variables

c) More than one dependent variable

d) Equal number of dependent and independent variables

Q. 25 The partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - 5 \frac{\partial^2 z}{\partial y^2} = 0$$

is classified as

- a) Elliptic
- b) Parabolic
- c) Hyperbolic
- d) Circle

Q. 26 The hourly wages of a sample of 130 system analysts are given below.

mean = 60 range = 20
mode = 73 variance = 324
median = 74

The coefficient of variation equals

- a) 0.30%
- b) 30%
- c) 5.4%
- d) 54%

Q. 27 The variance of a sample of 169 observations equals 576. The standard deviation of the sample equals

- a) 13
- b) 24
- c) 576
- d) 28,461

Q. 28 When the data are skewed to the right, the measure of Skewness will be

- a) negative
- b) zero
- c) positive
- d) one

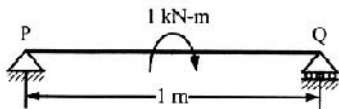
Q. 29 The relation between the number of pairs 'p' forming a kinematic chain and the number of links 'l' is

- a) $l = 2p - 2$
- b) $l = 2p - 3$
- c) $l = 2p - 4$
- d) $l = 2p - 5$

Q. 30 Streamline and equipotential line in a flow field

- a) are parallel to each other
- b) are identical to each other
- c) are perpendicular to each other
- d) intersect at acute angles

Q. 31 A simply supported beam carries a moment of 1 kN-m (CW) at mid span of the beam, the reactions at the right and left hand support will be respectively:



- a) 1kN downwards, 1 kN upwards
- b) 1kN upwards, 1 kN downwards
- c) 0.5kN upwards, 1 kN downwards
- d) 0.5kN downwards, 0.5 kN upwards

Q. 32 The percentage of carbon in gray cast iron is in the range of

- a) 0.25 to 0.75 %
- b) 1.25 to 1.75 %
- c) 3 to 4%
- d) 8 to 10 %

Q. 33 In PERT analysis a critical activity has

- a) Maximum float
- b) Zero float
- c) Maximum cost
- d) Minimum cost

Q. 34 Two 1 mm thick steel sheets are to be spot welded at a current of 5000 A. Assuming, effective resistance to be 200 micro-ohms and current flow time of 0.2 second, heat generated during the process will be

- a) 0.2 Joule
- b) 1 Joule
- c) 5 Joule
- d) 1000 Joules

Q. 35 The mechanism of material removal in EDM process is

- a) Melting and Evaporation
- b) Melting and Corrosion
- c) Erosion and Cavitation
- d) Cavitation and Evaporation

Q. 36 Two mating spur gears have 40 and 120 teeth. The pinion rotates at 1200 rpm and transmits a torque of 20 N-m, the torque transmitted by gear is

- a) 20 N-m
- b) 20/3 N-m
- c) 40 N-m
- d) 60 N-m

Q. 37 An element is subjected to a biaxial state of stress with a tensile stress in 'x' direction as 100 MPa and compressive stress in 'y' direction 20 MPa. The radius of Mohr's circle for the state of stress in appropriate units is

- a) 120
- b) 100
- c) 40
- d) 60

Q. 38 The S N curve for steel becomes asymptotic nearly at

- a) 10^3 cycles
- b) 10^5 cycles
- c) 10^6 cycles
- d) 10^9 cycles

Q. 39 In a window air conditioner, the expansion device used is

- a) Capillary tube
- b) Thermostatic expansion valve
- c) Automatic expansion valve
- d) Float valve

Q. 40 Formula for R134 a refrigerant is

- a) CH Cl F₂
- b) C₂ Cl₃ F₃
- c) C₂ Cl₂ F₄
- d) C₂ H₂ F₄

Q. 41 A redundant frame with 'n' members and 'j' joints is decided by

- a) $n=2j - 3$
- b) $n=2j + 3$
- c) $n>2j - 3$
- d) $n<2j - 3$

Q. 42 A body is said to be in equilibrium if

- a) The algebraic sum of vertical components of all forces is zero
- b) The algebraic sum of horizontal components of all forces is zero
- c) The algebraic sum of moments of all forces about a point is zero
- d) All above

Q. 43 Momentum of a body is given by

- a) Mass x velocity
- b) Mass x change of velocity
- c) Moment x distance
- d) Velocity x acceleration

Q. 44 In a thermal power plant, the coal is transferred from bunker to other places by

- a) hoist
- b) conveyor
- c) lift
- d) crane

Q. 45 The correct sequence of parameters in least importance for the location of a thermal power plant is

- a) Load, coal, water
- b) Water, load, coal
- c) Coal, water, load
- d) Water, coal, load

Q. 46 In a regenerative cycle, steam with enthalpy of 3514 kJ/kg is expanded in a turbine to a state corresponding to saturated enthalpy of water as 613 kJ/kg. If the pump water requirements in high pressure and low pressure zones are 3kJ/kg and 1 kJ/kg respectively, the amount of heat transferred in boiler is:

- a) 2897 kJ/kg
- b) 2898 kJ/kg
- c) 2904 kJ/kg
- d) 2905 kJ/kg

Q. 47 _____ is one of the causes of the upward flow of water in the soil and in plants.

- a) surface tension
- b) capillary action
- c) viscosity
- d) vapor pressure

Q. 48 The volume of fluid flowing across the section per second is

- a) Pressure
- b) Discharge

- c) Velocity
- d) Acceleration

Q. 49 Relative density of mercury is

- a) 1
- b) 9.8
- c) 13.6
- d) 1000

Q. 50 A Newtonian fluid is defined as the fluid which

- a) Obeys Hook's law
- b) Is compressible
- c) Obeys Newton's law of viscosity
- d) Is incompressible

Q. 51 If the Reynolds number is less than 2000, the flow in a pipe is

- a) Turbulent
- b) Laminar
- c) Transition
- d) None of the above

Q. 52 A flow is called super-sonic if the

- a) velocity of flow is very high
- b) discharge is difficult to measure
- c) Mach number is between 1 and 6
- d) Mach number is less than 1

Q. 53 The unit of pressure one bar is

- a) 1 Pascal
- b) 1 kilo Pascal
- c) 100 kPascal
- d) 1000 kPascal

Q. 54 The dynamic viscosity of a liquid is 1.2×10^{-4} Ns/m², whereas, the density is 600 kg/m³. The kinematic viscosity in m²/s is

- a) 72×10^{-3}

- b) 20×10^{-8}
- c) 7.2×10^3
- d) 70×10^6

Q. 55 In a static fluid, with 'y' as the vertical direction, 'ρ' as density, 'γ' as specific weight, and the pressure variation 'p' when there is no acceleration is given by

- a) $\frac{dp}{dy} = \dots$
- b) $\frac{dp}{dy} = -\dots$
- c) $\frac{dp}{dy} = x$
- d) $\frac{dp}{dy} = -x$

Q. 56 The location of the centre of pressure over a surface immersed in a liquid is

- a) always above the centroid
- b) will be at the centroid
- c) will be below the centroid
- d) for higher densities it will be above the centroid and for lower densities it will be below the centroid.

Q. 57 The continuity equation is the result of application of the following law to the flow field

- a) First law of thermodynamics
- b) Conservation of energy
- c) Newtons second law of motion
- d) Conservation of mass

Q. 58 A potential function

- a) is constant along a stream line
- b) is definable if a stream function is available for the flow
- c) describes the flow if it is rotational
- d) describes the flow if it is irrotational

Q. 59 In a steady flow of incompressible fluid, as the diameter is doubled, the velocity will
a) be halved
b) be doubled
c) increase four fold
d) decrease four fold

Q. 60 The differential manometer connected to two points along a pipe line gives a reading of h m. The flow will be
a) highest if the pipe is horizontal
b) independent of the slope of pipe and direction of flow
c) highest if flow is downwards
d) will depend on the fluid.

Q. 61 Reynolds number signifies the ratio of
a) gravity forces to viscous forces
b) inertial forces to viscous forces
c) inertia forces to gravity forces
d) buoyant forces to inertia forces.

Q. 62 In pipe flow the critical Reynolds number is about
a) 640
b) 5×10^5
c) 2000
d) 64000

Q. 63 The velocity profile in turbulent flow is
a) parabolic
b) logarithmic
c) 2nd degree polynomial
d) 4th degree polynomial

Q. 64 Anemometer is used to measure
a) Velocity
b) Pressure
c) Viscosity
d) Density.

Q. 65 Which of the following is an inversion of double slider crank chain ?

- a) Coupling rod of a locomotive
- b) Pendulum pump
- c) Oscillating cylinder engine
- d) Elliptical trammels

Q. 66 A differential gear in an automobile is a

- a) epicyclic gear train
- b) simple gear train
- c) compound gear train
- d) none of the above

Q. 67 In a clock mechanism, the gear train used to connect minute hand to hour hand, is

- a) epicyclic gear train
- b) reverted gear train
- c) compound gear train
- d) simple gear train

Q. 68 In vibration isolation system, if ω/ω_n is less than $\sqrt{2}$, then for all values of the damping factor, the transmissibility will be

- a) less than unity
- b) equal to unity
- c) greater than unity
- d) zero

where ω = Circular frequency of the system in rad/s, and

ω_n = Natural circular frequency of vibration of the system in rad/s.

Q. 69 In an under damped vibrating system, if x_1 and x_2 are the successive values of the amplitude on the same side of the mean position, then the logarithmic decrement is equal to

- a) x_1/x_2
- b) $\log (x_1/x_2)$
- c) $\log_e (x_1/x_2)$
- d) $\log (x_1.x_2)$

Q. 70 If hot water and cold water are mixed, the entropy of system will

- a) Increase
- b) Decrease
- c) Remain constant
- d) None of these

Q. 71 The device which delivers heat from low temperature to high temperature in a cyclic process by utilizing mechanical work is

- a) Heat engine
- b) Compressor
- c) Heat pump
- d) None of these

Q. 72 Which one of the following is a solid lubricant

- a) Grease
- b) Mineral oil
- c) Graphite
- d) Synthetic oil

Q. 73 The type of spring mostly used in rail wagons and road vehicles is:

- a) Spiral torsion
- b) Helical
- c) Leaf
- d) Belleville

Q. 74 If the metals are ductile and the cutting speed is high, then

- a) Continuous chips are formed
- b) Discontinuous chips are formed
- c) Continuous chips with built-up edges are formed
- d) None of these

Q. 75 Which of the following is the basic tool in work study?

- a) Process chart
- b) Bar chart
- c) Stop watch
- d) Planning chart

Q. 76 Theory which deals with the problem of reducing the waiting time is known as:

- a) Game theory
- b) Queuing theory
- c) Network theory
- d) Value engineering

Q. 77 MIS stands for

- a) Manufacturing information system
- b) Management inspection system
- c) Management integrated system
- d) Management information system

Q. 78 The process of heat transfer from one particle of the body to another without actual motion of the particle is called

- a) Radiation
- b) Conduction
- c) Convection
- d) None of these

Q. 79 Fourier law of heat conduction is based on the assumption that

- a) Heat flow through a solid is one dimensional
- b) Heat flow is in steady state
- c) Both a) and b)
- d) None of the options

Q. 80 Property of fluid that describes its internal resistance is known as:

- a) Viscosity
- b) Friction
- c) Resistance
- d) Internal energy

Q. 81 Which fluid does not experience shearing stress during flow?

- a) Pseudoplastic
- b) Inviscid
- c) Newtonian
- d) Dilatant

Q. 82 Stress strain relationship for Newtonian fluid is

- a) Parabolic
- b) Hyperbolic
- c) Linear
- d) Inverse type

Q. 83 Entropy change depends on

- a) Heat transfer
- b) Mass transfer
- c) Change in temperature
- d) Thermodynamic state

Q. 84 Recovery factor in flow of high velocity gases is a function of

- a) Reynolds number
- b) Prandtl number
- c) Pectlet number
- d) Rayleigh number

Q 85 To protect a surface from aerodynamic heating, the surfaces are often made of a material which melts taking off the heat of melting and producing cooling effect, it is called

- a) Ablative cooling
- b) Film cooling
- c) Convective cooling
- d) Transpiration cooling

Q. 86 Flow of rarefied gases is characterized by

- a) Mach number
- b) Knudson number
- c) Reynolds number
- d) Kinetic theory of gases

Q. 87 Which of the following is an integer linear programming problem?

- a) Transportation problem
- b) Assignment problem
- c) Primal dual problem
- d) All the above

Q.88 A linear programming problem in which all or some of the variables are constrained to assume non negative integer values is referred as:

- a) Integer programming problem
- b) Dynamic programming problem
- c) Non-linear programming problem
- d) None of these

Q. 89 If in a linear programming problem the number of variables in primal are 'n' and number of constraints in its dual are 'm', then

- a) $m < n$
- b) $m > n$
- c) $m = n$
- d) None of these

Q. 90 The two most basic inventory questions answered by the typical inventory model are

- a) timing and cost of orders
- b) quantity and cost of orders
- c) timing and quantity of orders
- d) order quantity and service level