

MRSPTU Ph.D. Entrance Test 2020 – Question Paper

Q1.	In a skew-symmetric matrix, all the diagonal elements are
A	1
B	0
C	∞
D	Indeterminate
Q2.	The Eigen values of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ are
A	8, 7, 3
B	15, 10, 3
C	15, 3, 0
D	2, 7, 2
Q3.	A function $f(x,y)$ of two independent variables x and y is continuous at the point (a,b) if $\lim_{\substack{x \rightarrow a \\ y \rightarrow b}} f(x,y) = f(a,b)$, subject to
A	x and y approach a and b respectively from left only
B	x and y approach a and b respectively from right only
C	x and y approach a and b respectively in any manner
D	x approaches a from left only and y approaches b from right only
Q4.	If $\mathbf{A} = 5t^2\mathbf{I} + t\mathbf{J} - t^3\mathbf{K}$ and $\mathbf{B} = \sin t \mathbf{I} - \cos t \mathbf{J}$, where \mathbf{A} & \mathbf{B} are vectors and \mathbf{I} , \mathbf{J} & \mathbf{K} are unit vectors, then $\frac{d}{dt}(\mathbf{A} \cdot \mathbf{B})$ is
A	$(5t^2 - 1) \cos t + 11t \sin t$
B	$(5t^2 - 1) \sin t - 11t \cos t$
C	$(5t^2 + 1) \cos t + 11t \sin t$
D	$(5t^2 - 1) \sin t + 11t \cos t$
Q5.	In a differential equation, if the dependent variable and its differential coefficients occur only in the first degree and are not multiplied together, the differential equation is
A	Linear
B	Non-linear
C	Partial
D	None of the above
Q6.	For the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0$, the roots of the auxiliary equation are:
A	-1, 2
B	-1, -2
C	1, -2

D	1, 2
Q7.	Real part of the complex number $e^{5+i\pi}$ is
A	-1
B	$-e^5$
C	1
D	e^5
Q8.	In statistics, mode is a measure of
A	Dispersion
B	Asymmetry
C	Probability
D	Central tendency
Q9.	A box contains 5 red and 10 black balls, out of which 8 balls are taken out and thrown away. What is the probability that the box now contains 2 red and 6 black balls?
A	12/50
B	50/96
C	96/140
D	140/429
Q10.	Which of the following numerical methods is not used for solving linear simultaneous equations?
A	Horner's method
B	Gauss elimination method
C	Gauss-Jordan method
D	Jacobi's Iteration method
Q11.	The maximum and minimum magnitude of resultant forces is 1000 N and 500 N at point. What are the values of two forces acting on it?
A	500 N, 500 N
B	450 N, 550 N
C	300 N, 700 N
D	300 N, 700 N
Q12.	Which method is used to determine centroid of a composite figure?
A	Analytical method
B	Graphical method
C	Both A and B
D	None of the above
Q13.	The Young's modulus of a perfectly rigid body is
A	Zero
B	One

C	Between zero and one
D	Infinite
Q14.	The actual breaking stress in stress-strain diagram is the ratio of
A	load at breaking point and reduced cross-sectional area
B	load at breaking point and original cross-sectional area
C	maximum load and original cross-sectional area
D	yield load and original cross-sectional area
Q15.	In which of the following is Coriolis component encountered?
A	Slider crank mechanism
B	Double slider chain mechanism
C	Quick return mechanism
D	Both (A) and (C)
Q16.	The module of a spur gear is given by
A	Ratio of pitch circle diameter to number of teeth
B	Product of pitch circle diameter and number of teeth
C	Ratio of number of teeth to pitch circle diameter
D	Product of pitch circle diameter and pressure angle
Q17.	A vibrating machine of 100 kg is mounted on a rubber pad which has stiffness of 500 N/m. Determine force transmitted to the foundation if the unbalanced force 500 N acts on it. The frequency ratio (ω/ω_n) is 1.5 and $\xi = 0.5$
A	462 N
B	400 N
C	362 N
D	Data is insufficient
Q18.	Critical damping depends upon
A	Mass and stiffness
B	Stiffness and viscosity of medium
C	Stiffness and amplitude
D	Mass and frequency of system
Q19.	A key connecting a flange coupling to a shaft is likely to fail in
A	Shear
B	Tension
C	Torsion
D	Bending
Q20.	In the Lewis equation, the working stress depends upon
A	Material of the tooth and pitch line velocity
B	Pitch line velocity and load conditions
C	Load conditions and material of the tooth
D	Pitch line velocity, Load conditions and material of the tooth

Q21.	What is the effect of free stream velocity on thickness of boundary layer?	
A	Increase in free stream velocity increases the boundary layer thickness	
B	Increase in free stream velocity decreases the boundary layer thickness	
C	Decrease in free stream velocity decreases the boundary layer thickness	
D	Free stream velocity does not affect the boundary layer thickness	
Q22.	The graph of change in shear stress with respect to velocity gradient, shown here, represents which type of the fluid?	
A	Ideal fluid	
B	Dilatant fluid	
C	Newtonian fluid	
D	Non-Newtonian fluid	
Q23.	Which of the following is the correct formula for Euler's equation of motion? Where, ρ = density of the fluid, P = pressure force, g = acceleration due to gravity, v = velocity of the fluid	
A	$(\partial P/\rho) + (\partial g/\rho) + (\partial v/\rho) = 0$	
B	$(\partial \rho/P) + (\partial g/\rho) + (v dv) = 0$	
C	$(\partial P/\rho) + (gdz) + (v dv) = 0$	
D	$((\partial \rho/P) + (gdz) + (v dv) = 0$	
Q24.	Which of the following is measured by a rotameter?	
A	Velocity of fluids	
B	Discharge of fluids	
C	Viscosity of fluids	
D	Density of fluids	
Q25.	The total inclination angle of short converging conical tube in venturimeter is	
A	$11 \pm 1^\circ$	
B	$21 \pm 1^\circ$	
C	$30 \pm 1^\circ$	
D	$60 \pm 1^\circ$	
Q26.	Which among the following statement is incorrect?	
A	Energy is an extensive property	
B	Specific energy is an extensive property	
C	Energy is a point function	
D	Heat capacity is an extensive property	
Q27.	A quasi-static process is	
A	a stationary process	
B	an infinitely slow process	
C	a random process	
D	a spontaneous process	

Q28.	A cyclic heat engine operates between a source temperature of 927°C and a sink temperature of 27°C. The maximum efficiency of the heat engine is
A	100%
B	80%
C	75%
D	70%
Q29.	The dryness (x) fraction of superheated steam is taken as
A	0
B	0.1
C	0.9
D	1.0
Q30.	What is the perfect condition for dehumidification of air?
A	Air is heated above its dew point temperature
B	Air is cooled up to its dew point temperature
C	Air is heated below its dew point temperature
D	Air is cooled below its dew point temperature
Q31.	In Iron-Carbon equilibrium diagram, cementite changes from ferromagnetic to paramagnetic in character at a temperature of approximately
A	190°C
B	207°C
C	247°C
D	723°C
Q32.	Which of the following alloy is used for manufacturing food-processing machinery?
A	Inconel
B	Monel metal
C	Alnico
D	Pewter
Q33.	Cores are normally employed in castings to
A	Make molten metal rise in riser
B	Reduce the solidifying rate
C	Make cavities in casting
D	Supplement gating system
Q34.	Which of the following processes is most commonly used for forging of bolt heads of hexagonal shape?
A	Closed die drop forging
B	Open die upset forging
C	Closed die press forging
D	Open die progressive forging

Q35.	The presence of residual flux after the welding operation leads to
A	Porosity
B	Corrosion
C	Crack formation
D	Embrittlement
Q36.	The design of cutting tools is based on
A	Tensile strength
B	Rigidity
C	Compactness
D	Bending stress
Q37.	The cutting speed in turning operation would be least in case of
A	Aluminium
B	Mild steel
C	Stainless steel
D	Medium carbon steel
Q38.	Which of the following has highest accuracy?
A	External micrometer
B	Vernier height gauge
C	Internal micrometer
D	Dial indicator
Q39.	In CAD, solid models are constructed using basic 3-D shapes called
A	Basic Solids
B	3-D Solids
C	Primitives
D	Parallelepipeds
Q40.	In ABC analysis, the items which require maximum control are represented by
A	A+B+C
B	B + C
C	A+C
D	A

MRSPTU Ph.D. Entrance Test 2020 – Answer Key

Q. No.	A. Key		Q. No.	A. Key
1	B		21	B
2	C		22	D
3	C		23	C
4	A		24	B
5	A		25	B
6	C		26	B
7	B		27	B
8	D		28	C
9	D		29	D
10	A		30	D
11	D		31	B
12	C		32	A
13	D		33	C
14	A		34	C
15	C		35	B
16	A		36	B
17	A		37	C
18	A		38	D
19	A		39	C
20	D		40	D