**Department of Mechanical Engineering**

**School of Engineering**

**University of Management & Technology**

Entrance Exam 2023

PhD in Mechanical Engineering

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Roll No:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Note: This question paper consists of 100 questions. Attempt all questions.**

**Questions**

1. Which of the following is a basic classification of Engineering Materials?
2. Metals
3. Non-Metals
4. Both Metals & Non-Metals
5. None of the mentioned
6. Which of the following is an example of a thermoplastic?
7. Melamine
8. Epoxide
9. Urethane
10. Acetal
11. Which of the following class of engineering ceramics generally includes lubricant materials?
12. Metalloids
13. Intermetallics
14. Sulphides
15. Carbides
16. On which of the following materials the compressive test is done?
17. Aluminum
18. Thermocole
19. Cast iron
20. Gold
21. Which of these is not a function of alloy steels?
22. Improves ductility
23. Improves machinability
24. Increases strength
25. Reduces cost
26. Which of the following is the primary element used for making stainless steel alloy?
27. Vanadium
28. Indium
29. Chromium
30. Zirconium
31. Which of the following carbides are used for cutting tools?
32. Chromium carbide
33. Silicon carbide
34. Tungsten carbide
35. Vanadium carbide
36. Which of the following machine is used to measure compressive strength?
37. Universal testing machine
38. Impact testing machine
39. Fatigue testing machine
40. Erichsen machine
41. With an increase in strain rate, ductility \_\_\_\_\_\_ and tensile strength \_\_\_\_\_
42. Decreases, decreases
43. Decreases, increases
44. Increases, increases
45. Increases, decreases
46. In what terms, fatigue life is measured?
47. Time of failures
48. Number of cycles of failure
49. Stress of failure
50. Appearance of fracture
51. Which of the following is the basic principle of fluid mechanics?
52. Momentum principle
53. Energy equation
54. Continuity equation
55. All of the mentioned
56. If a person studies about a fluid which is at rest, what will you call his domain of study?
57. Fluid Dynamics
58. Fluid Mechanics
59. Fluid Statics
60. Fluid Kinematics
61. Which of the following method is most commonly used in fluid mechanics for analysis?
62. Eulerian Method
63. Control volume analysis
64. Langragian method
65. None of the mentioned
66. When is a fluid called turbulent?
67. High viscosity of fluid
68. Reynolds number is greater than 2300
69. Reynolds number is less than 2000
70. The density of the fluid is low
71. The compressible flow is assumed to be \_\_\_\_\_\_\_\_\_\_\_\_\_
72. Adiabatic only
73. Isentropic only
74. Isentropic and adiabatic
75. Polytropic
76. Which of the following is a type of fluid based on viscosity?
77. Real Fluid
78. Ideal Fluid
79. Newtonian Fluid
80. All of the mentioned
81. When the body is completely or partially immersed in a fluid, how much its weight be distributed for it to be in stable equilibrium.
82. Is independent of weight distribution
83. Around the lower part
84. Around the upper part
85. None of the mentioned
86. Which of the following is a formula for the friction factor of circular pipes?
87. Re/64
88. 16/Re
89. 64/Re
90. Re/16
91. Which among the following have the same forces acting on them?
92. Dynamic similarity
93. Geometric similarity
94. Conditional similarity
95. Kinematic similarity
96. Pressure variation for compressible fluid is maximum for which of the following kind of process?
97. Adiabatic
98. Quasi Static
99. Isothermal
100. None of the mentioned
101. An adiabatic process is one in which
102. No heat enters or leaves the gas
103. The temperature of the gas changes
104. The change in internal energy is equal to the mechanical work-done
105. All of the above
106. Work-done in a free expansion process is
107. zero
108. minimum
109. maximum
110. positive
111. The efficiency of Diesel cycle approaches to Otto cycle efficiency when
112. Cut-off is increased
113. Cut-off is decreased
114. Cut-off is zero
115. Cut-off is constant
116. If the value of n = 0 in the equation pvn = C, then the process is called
117. Constant volume process
118. Adiabatic process
119. Constant pressure process
120. Isothermal process
121. Which of the following statement is incorrect?
122. The liquid fuels consist of hydrocarbons.
123. The liquid fuels have higher calorific value than solid fuels.
124. The solid fuels have higher calorific value than liquid fuels.
125. A good fuel should have low ignition point.
126. One kg of carbon monoxide requires \_\_\_\_\_\_\_\_\_\_ kg of oxygen to produce 11/7 kg of carbon dioxide gas.
127. 8/7
128. 4/7
129. 11/4
130. 9/7
131. When heat is transferred from one particle of hot body to another by actual motion of the heated particles, it is referred to as heat transfer by
132. Conduction
133. Convection
134. Radiation
135. Conduction and convection
136. The insulation ability of an insulator with the presence of moisture would
137. Increase
138. Decrease
139. Remain unaffected
140. May increase/decrease, depending on temperature and thickness of insulation
141. Heat transfer in liquid and gases takes place by
142. Conduction
143. Convection
144. Radiation
145. Conduction or convection depending upon the fluid movement
146. Metals are good conductors of heat because
147. their atoms collide frequently
148. their atoms-are relatively far apart
149. they contain free electrons
150. they have high density
151. Which of the following is a case of steady state heat transfer?
152. I.C. Engine
153. Air preheaters
154. Heating of building in winter
155. None of the above
156. Temperature of steam at around 540°C can be measured by
157. Thermometer
158. Radiation UV- pyrometer
159. Thermistor
160. Thermocouple
161. Heat flows from one body to other when they have
162. Different heat contents
163. Different specific heat
164. Different atomic structure
165. Different temperatures
166. LMTD in case of counter flow heat exchanger as compared-to parallel flow heat exchanger is
167. Higher
168. Lower
169. Same
170. Depends on the area of heat exchanger
171. A steam pipe is to be insulated by two insulating materials put over each other for best results
172. Better insulation should be put over pipe and better one over it
173. Inferior insulation should be put over pipe and better one over it
174. Both may be put in any order
175. Whether to put inferior oil over pipe or the better one would depend on steam temperature
176. According of Kirchhoff's law,
177. Radiant heat is proportional to fourth power of absolute temperature
178. Emissive power depends on temperature
179. Emissive power and absorptivity are constant for all bodies
180. Ratio of emissive power to absorptive power for all bodies is same and is equal to the emissive power of a perfectly black body.
181. The concept of overall coefficient of heat transfer is used in case of heat transfer by
182. Conduction
183. Convection
184. Radiation
185. Conduction and convection
186. Joule sec is the unit of
187. Universal gas constant
188. Kinematic viscosity
189. Thermal conductivity
190. Planck's constant
191. Emissivity of a white polished body in comparison to a black body is
192. Higher
193. Lower
194. Same
195. Depends upon the shape of body
196. A grey body is one whose absorptivity
197. Varies with temperature
198. Varies with wavelength of the incident ray
199. Is equal to its emissivity
200. Does not vary with temperature and. Wavelength of the incident ray
201. A vapor compression refrigeration system is an improved type of air refrigeration system in which a suitable working substance, termed as refrigerant is used.
202. True
203. False
204. The vapor compression refrigeration system is similar to a \_\_\_\_\_\_\_\_
205. Latent heat pump
206. Latent heat engine
207. Generator
208. Evaporator
209. The COP of vapor compression refrigeration compared to simple air refrigeration system is
210. high
211. low
212. same
213. None of above
214. The low pressure and temperature vapor refrigerant enters the \_\_\_\_\_\_ of the vapor compression system.
215. compressor
216. condenser
217. receiver
218. evaporator
219. The pipe line emanating from compressor up to the condenser is called \_\_\_\_\_\_\_\_
220. Suction line
221. Pipe line
222. Liquid line
223. Delivery line
224. After which process during the VCR cycle, the highest temperature is achieved?
225. Evaporation
226. Expansion
227. Condensation
228. Compression
229. In a domestic vapour compression refrigerator, which of the following refrigerants commonly used?
230. CO2
231. NH3
232. Freon
233. Air
234. What is the effect of an increase in discharge pressure on C.O.P.?
235. C.O.P. decreases
236. C.O.P. increases
237. C.O.P. remains the same
238. C.O.P. becomes zero
239. Which of the following factor of the actual VCR affects severely the coefficient of performance?
240. Increase in suction pressure
241. Decrease in discharge pressure
242. Decrease in suction pressure
243. Increase in discharge pressure
244. Mass of refrigerant required in the heat exchanger is exactly equal to the mass of flash that would form in a simple saturation cycle.
245. True
246. False
247. Which hydraulic machine convert mechanical energy into pressure energy?
248. Pump
249. Refrigerator
250. Heat engine
251. Turbine
252. Dynamic pumps are also known as \_\_\_\_\_\_
253. Positive displacement pumps
254. Non-positive displacement pumps
255. Reciprocating pump
256. Rotary pump
257. Which of the following is not an advantage of centrifugal pump?
258. Low initial cost
259. High efficiency
260. Difficult installation
261. Easy maintenance
262. Negative slip occurs in reciprocating pumps, when delivery pipe is \_\_\_\_\_\_
263. Long and suction pipe is short and pump is running at low speed
264. Long and suction pipe is short and pump is running at high speed
265. Short and suction pipe is long and pump is running at low speed
266. Short and suction pipe is long and pump is running at high speed
267. Which one of the following is not an assumption of condensation heat regime taken to calculate the heat transfer coefficient?
268. Presence of linear temperature profile
269. Absence of high pressure
270. Absence of viscous shear of the vapour
271. Thickness of the film is too small to create a temperature difference
272. Wet bulb depression, under saturated ambient air conditions \_\_\_\_\_\_\_\_\_\_\_\_\_
273. Is always positive
274. Is always negative
275. Is always zero
276. May have value depending upon the dew point temperature
277. When a stream of moist air is passed over a cold and dry cooling coil such that no condensation takes place, then the air stream will get along the line of \_\_\_\_\_\_\_\_\_\_
278. Constant wet bulb temperature
279. Constant dew point temperature
280. Constant relative humidity
281. Constant enthalpy
282. If the structure is divided into discrete areas or volumes then it is called an \_\_\_\_\_\_\_
283. Structure
284. Element
285. Matrix
286. Boundaries
287. In finite element modeling nodal points are connected by unique \_\_\_\_\_\_\_\_
288. Surface
289. Shape
290. Eigen values
291. Matrix
292. In finite element modeling every element connects to \_\_\_\_\_\_\_
293. 4 nodes
294. 3 nodes
295. 2 nodes
296. Infinite no of nodes
297. In one dimensional problem, each node has \_\_\_\_\_\_\_\_\_ degrees of freedom.
298. 2 degrees of freedom
299. 3 degrees of freedom
300. No degrees of freedom
301. 1 degree of freedom
302. Plane trusses are also known as \_\_\_\_\_
303. One–dimensional trusses
304. Two-dimensional trusses
305. Three-dimensional trusses
306. Poly dimensional trusses
307. A truss structure consists only \_\_\_ force members.
308. Only one
309. Two
310. Three
311. Poly
312. The truss element is a \_\_\_\_\_ when we see it in a local co-ordinate system.
313. Three dimensional
314. One dimensional
315. Two dimensional
316. Thermal component
317. Which of the following disciplines provides study of inertia forces arising from the combined effect of the mass and motion of the parts?
318. Theory of machines
319. Applied mechanics
320. Kinematics
321. Kinetics
322. Which of the following disciplines provides study of relative motion between the parts of a machine?
323. Theory of machines
324. Applied mechanics
325. Kinematics
326. Kinetics
327. A wheel accelerates uniformly from rest to 2000 r.p.m. in 20 seconds. How many revolutions does the wheel make in attaining the speed of 2000 r.p.m.?
328. 400
329. 300
330. 333.4
331. 200
332. When a particle moves along a straight path, then the radius of curvature is
333. Infinitely small
334. Zero
335. Infinitely great
336. None of the mentioned
337. A horizontal bar 1.5 metres long and of small cross-section rotates about vertical axis through one end. It accelerates uniformly from 1200 r.p.m. to 1500 r.p.m. in an interval of 5 seconds. What is the linear velocity at end of the interval?
338. 188.6 m/s
339. 235.5 m/s
340. 300 m/s
341. 400 m/s
342. In a squared and ground helical spring the effective number of turns is increased by
343. 1
344. 2
345. 1.5
346. 0
347. Stiffness of the spring can be increased by
348. Increasing the number of turns
349. Increasing the free length
350. Decreasing the number of turns
351. Decreasing the spring wire diameter
352. The two parallel and coplanar shafts are connected by gears having teeth parallel to the axis of the shaft. This arrangement is called
353. Spur gearing
354. Helical gearing
355. Bevel gearing
356. Spiral gearing
357. In a cone pulley, if the sum of radii of the pulleys on the driving and driven shafts is constant, then
358. Open belt drive is recommended
359. Crossed belt drive is recommended
360. Both open belt drive and crossed belt drive is recommended
361. The drive is recommended depending upon the torque transmitted
362. When two pulleys of different diameters are connected by means of an open belt, the angle of contact at the \_\_\_\_\_\_\_\_\_pulley must be taken into consideration.
363. Smaller
364. Larger
365. Medium
366. None of the mentioned
367. V-belts are usually used for
368. long drives
369. short drives
370. long and short drives
371. none of the mentioned
372. Orthographic projection is drawn using two methods which is \_\_\_\_\_\_\_\_\_\_\_
373. Second angle and third angle method
374. First angle and third angle method
375. First angle and fourth angle method
376. Second angle and fourth angle method
377. In first angle method the top view is drawn \_\_\_\_\_\_\_ of the front view.
378. Above
379. Right side
380. Left side
381. Bottom
382. If the total detail is not obtained from the three directional views the \_\_\_\_\_\_ is drawn.
383. Pictorial view
384. Oblique view
385. Perspective view
386. Two-dimensional view
387. Shear stress at top most fibre of rectangular section is \_\_\_\_\_\_\_\_\_\_\_\_\_
388. Maximum
389. Minimum
390. Zero
391. Uniform through out
392. In steel sections, the junction between a flange and web is known as \_\_\_\_\_\_\_\_
393. Edge
394. Fillet
395. Corner
396. Lug
397. The endurance limit in shear of carbon steel can be obtained by multiplying the endurance limit in flexure by a factor of
398. 0.25
399. 0.45
400. 0.55
401. 0.75
402. At low temperatures (say 75°C) the notched-bar impact value of steel
403. Increases markedly
404. Decreases markedly
405. Remains same
406. Depends on heat treatment carried out
407. The crest diameter of a screw thread is same as
408. Major diameter
409. Minor diameter
410. Pitch diameter
411. Core diameter
412. Maximum principal stress theory is applicable for
413. Ductile materials
414. Brittle materials
415. Elastic materials
416. All of the above
417. The deflection of a cantilever beam under load W is 8. If its width is halved, then the deflection under load W will be
418. 28
419. 8/2
420. 48
421. 8/4
422. Machine screws are
423. Similar to small size tap bolts except that a greater variety of shapes of heads are available
424. Slotted for a screw driver and generally used with a nut
425. Used to prevent relative motion be-tween two parts
426. Similar to stud
427. Rivets are generally specified by
428. Thickness of plates to be riveted
429. Length of rivet
430. Diameter of head
431. Nominal diameter
432. The edges of a boiler plate are bevelled to an angle of
433. 30°
434. 45°
435. 60°
436. 80°
437. In order to avoid tearing of the plate at edge, the distance from the center line of the rivet hole to the nearest edge of the plate in terms of dia. of rivet d should be equal to
438. d
439. 1.25 d
440. 1.5 d
441. 1.75 d
442. Transverse fillet welded joints are designed for
443. Tensile strength
444. Compressive strength
445. Shear strength
446. Bending strength
447. Scavenging air in diesel engine means
448. Air used for combustion sent under pressure
449. Forced air for cooling cylinder
450. Burnt air containing products of combustion
451. Air used for forcing burnt gases out of engine's cylinder during the exhaust period
452. The ratio of indicated thermal efficiency to the corresponding air standard cycle efficiency is called
453. Net efficiency
454. Cycle efficiency
455. Relative efficiency
456. Overall efficiency
457. If the intake air temperature of I.C. engine increases, its efficiency will
458. Increase
459. Decrease
460. Remain same
461. Unpredictable
462. Fuel oil consumption guarantees for I.C. engine are usually based on
463. Low heat value of oil
464. High heat value of oil
465. Net calorific value of oil
466. Calorific value of fuel
467. If the compression ratio of an engine working on Otto cycle is increased from 5 to 7, the percentage increase in efficiency will be
468. 2%
469. 4%
470. 8%
471. 14%
472. The maximum temperature in the I.C. engine cylinder is of the order of
473. 500 - 1000°C
474. 1000 - 1500°C
475. 1500 - 2000°C
476. 2000 - 2500°C
477. The temperature of interior surface of cylinder wall in nonnal operation is not allowed to exceed
478. 80°C
479. 120°C
480. 180°C
481. 240°C
482. The saturation temperature of steam with increase in pressure increases
483. Linearly
484. Rapidly first and then slowly
485. Slowly first and then rapidly
486. Inversely
487. The equivalent evaporation of a boiler is a measure to compare
488. The given boiler with the model
489. Any type of boilers operating under any conditions.
490. Two different makes of boilers operating under the same operating conditions
491. Two boilers of same make but operating under different conditions
492. The moisture content in the later stages of steam turbine \_\_\_\_\_\_\_\_ when the plant is operating at lower condenser pressure.
493. Increases
494. Decreases
495. Remain constant
496. May increase or decrease