MEGA MOCK CHALLENGE

gradeup

UPPSC AE 2020 PAPER-1

Mechanical Engineering

Mega Mock Challenge
(May 16- May 17 2020)

Questions & Solutions

1. **'शक्ति की उपासना करने वाले'** को क्या कहते है? सही विकल्प बताइए -

A. शैव
B. वैष्णव
C. शाक्त
D. नाथपंती

Ans. C

Sol. एकार्थी शब्द का अर्थ: जिन शब्दों का प्रयोग अनेक शब्दो के स्थान पर किया जाए उन शब्दों को एकार्थी शब्द कहते है।

'शक्ति की उपासना करने वाले' को **शाक्त (शक्ति संबंधी)** कहते है।

अन्य शब्दों के अर्थ -

नाथपंती - नाथ पंथ का अनुयायी।

वैष्णव - विष्णु का उपासक

शैव - शिव के उपासक या भक्त

2. अशुद्ध विकल्प चुनिए :

A. जो कम बोलने वाला हो – अल्पभाषी
B. जो प्रमाण से सिद्ध न हो – प्रमाण्य
C. जो किसी पर अभियोग लगाए – अभियोगी
D. वर्षा का बिलकुल न होना – अनावृष्टि

Ans. B

Sol. जो प्रमाण से सिद्ध न हो वाक्य के शुद्ध शब्द अप्रमेय होता है

प्रमाण्य का अर्थ - जो सर्वमान्य हो

अन्य शब्द के अर्थ सही है –

जो कम बोलने वाला हो – अल्पभाषी

जो किसी पर अभियोग लगाए – अभियोगी

वर्षा का बिलकुल न होना – अनावृष्टि

3. न सावन सूखे न भादो हरे " कहावत का अर्थ है –

A. सुख – दुःख का भेद न जानना
B. हमेशा एक ही मानसिक स्थिति में होना
C. सदैव दुखी रहना
D. थोड़े में खुश रहना

Ans. B

Sol. न सावन सूखे न भादो हरे - हमेशा एक ही मानसिक स्थिति में होना

4. पिता के लिए उसकी पुत्री आँखों का तारा होती है। रेखांकित मुहावरे का अर्थ क्या अर्थ है?

A. बहुत बुद्धिमान
B. बहुत प्रिय
C. बहुत भाग्यशाली
D. बहुत समझदार

Ans. B

5. शुद्ध वर्तनी का चयन कीजिए-

A. कल्यान
B. प्रतिग्या
C. योग्य
D. कलस

Ans. C

Sol. वर्तनी - भाषा की वर्तनी का अर्थ उस भाषा में शब्दों को वर्णों से अभिव्यक्त करने की क्रिया को कहते हैं।

दिए गए विकल्पों में योग्य शब्द की वर्तनी शुद्ध है अन्य विकल्पों की वर्तनी अशुद्ध है।

शुद्ध वर्तनी - अशुद्ध वर्तनी

कल्याण - कल्यान

प्रतिज्ञा - प्रतिग्या

कलश - कलस

6. निम्नांकित विकल्पों में से कौन-सा '**तामसिक**' का विलोम शब्द है? सही विकल्प बताइए।

A. तामसक
B. सात्विक
C. तिमिर
D. तिक्त

Ans. B

Sol. विलोम शब्द - ऐसे शब्द जिनके अर्थ विपरीतया उल्टा हों, उन शब्दों को विलोम शब्द कहते हैं।

दिए गए शब्दों में **तामसिक** का विलोम शब्द **सात्विक** है।

तामसिक शब्द का अर्थ अंधकार संबंधी, तमोगुण संबंधी से है तथा सात्विक का अर्थ सत्त्वगुण संपन्न सम्बंधित होता है।

अन्य शब्दों के अर्थ -

तिमिर - अँधेरा

तिक्त - जिसका स्वाद चिरायते या नीम जैसा हो।

7. निम्नांकित विकल्पों में से कौन-सा 'तद्भव' शब्द है? सही विकल्प बताए।

A. रात्रि
B. वेदना
C. लोमश
D. बिजली

Ans. D

Sol. तद्भव= तत्+भाव जिसका अर्थ है विकसित या उससे उत्पन्न होना। अर्थात वे शब्द जो संस्कृत या उससे उत्पन्न हुए हैं। या ऐसे संस्कृत शब्द जो कुछ रूप परिवर्तन के साथ हिंदी शब्दावली में आ गए।

तत्सम= तत+सम= उसके समान अर्थात ऐसे शब्द जो संस्कृत से हिंदी में आये और ज्यों के त्यों रहे, तत्सम शब्द कहलाते हैं।

बिजली शब्द तद्भव शब्द है अन्य विकल्पो का तत्सम रूप दिया गया है।

तत्सम शब्द – तद्भव शब्द

रात्रि – रात

वेदना – बेदना

लोमश – लोमड़ी

विद्युत – बिजली

8. निम्न में से किस शब्द में "**प्रति**" उपसर्ग का प्रयोग किया गया है?

A. परिक्रमा B. प्रख्यात

C. प्रत्येक D. प्रकृति

Ans. C

Sol. उपसर्ग दो शब्दों से मिलकर बना होता है उप+सर्ग। उप का अर्थ होता है समीप और सर्ग का अर्थ होता है सृष्टि करना।

उपसर्ग वे शब्द हैं जो अन्य शब्दों के पहले जोड़े जाते हैं और जुड़कर उनके अर्थ में वैशिष्ट्य ला देते हैं।

उपसर्ग + अन्य शब्द = नया शब्द

दी गए विकल्पों में प्रति उपसर्ग का प्रयोग – प्रत्येक शब्द में किया गया है अन्य शब्दों में प्रति उपसर्ग नहीं है

प्रत्येक – प्रति + एक

प्रख्यात = प्र + ख्यात

परिक्रमा = परि + क्रमा

प्रकृति = प्र + कृति

9. निम्न में से किस शब्द में **"हम"** उपसर्ग का प्रयोग नहीं हुआ है?

A. हमराह B. हमउम्र

C. हरसाल D. हमदम

Ans. C

Sol. **उपसर्ग** दो शब्दों से मिलकर बना होता है उप+सर्ग। उप का अर्थ होता है समीप और सर्ग का अर्थ होता है सृष्टि करना।

उपसर्ग वे शब्द हैं जो अन्य शब्दों के पहले जोड़े जाते हैं और जुड़कर उनके अर्थ में वैशिष्ट्य ला देते हैं।

उपसर्ग + अन्य शब्द = नया शब्द

हरसाल शब्द में हम उपसर्ग का प्रयोग नहीं हुआ है।

हमराह – हम + राह

हमउम्र – हम + उम्र

हरसाल – हर + साल

हमदम – हम + दम

10. 'अध्ययन' के संधि-विच्छेद का सही विकल्प कौन-सा है?

A. अध्य + यन
B. अधि + यन
C. अधि + अयन
D. अध् + अयन

Ans. C

Sol. संधि – दो वर्णों के मेल को संधि कहते है।

अध्ययन = अधि + अयन (यण संधि)

नियम - इ या ई के बाद कोई अन्य स्वर आए तो इ या ई 'य्' में बदल जाता है और अन्य स्वर य् से जुड़ जाते हैं।

व्यंजन संधि - व्यंजन का व्यंजन से अथवा किसी स्वर से मेल होने पर जो परिवर्तन होता है उसे व्यंजन संधि कहते हैं।

11. **विषधर** में कौन सा समास है?

A. कर्मधारय तत्पुरुष समास
B. संप्रदान तत्पुरुष समास
C. अव्ययीभाव समास
D. बहुव्रीहि समास

Ans. D

Sol. समास - समास का तात्पर्य है 'संक्षिप्तीकरण'। दो या दो से अधिक शब्दों से मिलकर बने हुए एक नवीन एवं सार्थक शब्द को समास कहते हैं।

विषधर = विष को धारण करने वाला (सर्प)

बहुव्रीहि समास - इस समास में कोई भी पद प्रधान न होकर अन्य पद प्रधान होता है विग्रह करने पर नया शब्द निकलता है।

12. निम्न में से किस शब्द की संधि शुद्ध है –

A. ततैव - तत + एव
B. महौषद - महा + ओषध
C. ज्ञानोपदेश - ज्ञान + ओपदेश
D. यथोचित - यथा + ऊचित

Ans. A

Sol. तत + एव : ततैव (अ + ए = ऐ)

महा + औषध : महौषद (आ + औ = औ)

ज्ञान + उपदेश : ज्ञानोपदेश (अ + उ = ओ)

यथा + उचित – यथोचित (अ + उ = ओ)

13. यशोदा हरि पालने झुलावे, हलरावे दुलराय मल्हावे, जोई सोई कछू गावे"

इन पंक्तियों में कौन सा रस है ?

A. शांत रस
B. वत्सल रस
C. रौद्र रस
D. करुण रस

Ans. B

Sol. यशोदा हरि पालने झुलावे,हलरावे दुलराय मल्हावे,जोई सोई कछू गावे" पंत्ति से यशोदा जी के द्वारा कृष्ण को झुला झुलाना और खिलाना और गीत गाने का भाव प्रस्तुत है जिससे श्रोता के मन में एक बचपन की झलक उत्पन्न होती है अत: पंत्ति में वत्सल रस है।

वत्सल रस - वत्सल रस का स्थायी भाव वात्सल्यता होता है वत्सल रस में माता का पुत्र के प्रति प्रेम, बड़ों का बच्चों के प्रति प्रेम, और यही स्नेह और प्रेम का भाव वात्सल्य रस कहलाता है।

14. निम्नलिखित में कौनसा शब्द स्त्रीलिंग नही है।

A. झुरमुट
B. अंत्येष्टि
C. इच्छा
D. उपासना

Ans. A

Sol. प्राणीवाचक शब्द हमेशा पुरुष जाति का ही बोध करते हैं। जैसे बालक, गीदड़, कौआ, कवि, साधु, खटमल आदि अतः झुरमुट एक पुल्लिंग है।

15. **'नारी'** शब्द का बहुवचन क्या होगा ?

A. नारीएँ
B. नारियाँ
C. नारीओ
D. नारी

Ans. B

Sol. इकारांत या ईकारांत स्त्रीलिंग शब्दों के अंत में 'याँ' शब्द लगा देने से और दीर्घ ई को ह्रस्व इ कर देने शब्द बहुवचन में बदल जाता है। जैसे नारी-नारियाँ, नीति-नीतियाँ आदि।

16. "मै राम के घर पहुंचा परन्तु वह स्कूल जा चुका था" इस वाक्य में कौन सा विराम चिन्ह लगेगा?

A. (,)
B. (:)
C. (;)
D. (`)

Ans. A

Sol. विराम चिन्ह - विराम का अर्थ होता है विश्राम या रूकना। अथार्त वाक्य लिखते समय विराम को प्रकट करने के लिए लगाये जाने वाले चिन्ह को ही विराम चिन्ह कहते हैं।

वाक्य में प्रयुक्त होने वाले अव्ययों किन्तु, परन्तु, पर, लेकिन, आदि के पहले अल्प विराम लगते है ।

जैसे - मै राम के घर, पहुंचा परन्तु वह स्कूल जा चुका था

17. निम्न में से सघोष वर्ण हैं।

A. क,ग
B. ट,ड,ण
C. द,ध,न
D. फ,ब,भ

Ans. C

Sol. वर्ण - हिन्दी भाषा में प्रयुक्त सबसे छोटी इकाई वर्ण कहलाती है। सघोष वर्ण - जिन वर्णों के उच्चारण में केवल नाद का उपयोग होता है, उन्हे घोष या सघोष वर्ण कहते हैं। इनकी संख्या 31 होती है। इसमें सभी स्वर अ से ओ तक और

ग, घ, ङ

ज, झ, ञ

ड, ढ, ण

द, ध, न

ब, भ, म

य, र, ल, व, ह

18. दिए गए वाक्य में (**हमारी**)रेखांकित शब्द का पुरुष ज्ञात कीजिए ।

बारिश में **हमारी** पुस्तकें भीग गई ।

A. उत्तम पुरूषवाचक
B. माध्यम पुरूषवाचक
C. प्रथम पुरूषवाचक
D. अन्य पुरूषवाचक

Ans. A

Sol. उत्तम पुरूषवाचक - जिन सर्वनामों का प्रयोग बोलने वाला अपने लिए करता है, उन्हें उत्तम पुरुषवाचक कहते है।

जैसे- मैं, हमारा, हम, मुझको, हमारी

बारिश में हमारी पुस्तकें भीग गई । वाक्य में हमारी शब्द का प्रयोग करके खुद के बारे में बता रहा है। अतः ये शब्द उत्तम पुरुष की श्रेणी में आयेंगे।

मध्यम पुरुषवाचक - जिन सर्वनामों का प्रयोग सुनने वाले के लिए किया जाता है, उन्हें मध्यम पुरुषवाचक कहते है।

जैसे- तू, तुम, तुम्हे, आप, तुम्हारे, तुमने, आपने आदि।

अन्य पुरुषवाचक - जिन सर्वनाम शब्दों का प्रयोग किसी अन्य व्यक्ति के लिए किया जाता है, उन्हें अन्य पुरुषवाचक कहते है।

जैसे- वे, यह, वह, इनका, इन्हें, उसे, उन्होंने, इनसे, उनसे आदि।

19. दिए गए वाक्य में (सुंदरता) रेखांकित शब्द की संज्ञा ज्ञात कीजिए ।

ताजमहल की **सुंदरता** का वर्णन करना बहुत ही कठिन है ।

A. द्रव्यवाचक संज्ञा
B. व्यक्तिवाचक संज्ञा
C. भाववाचक संज्ञा
D. समुदायवाचक संज्ञा

Ans. C

Sol. भाववाचक संज्ञा - जो शब्द किसी चीज़ या पदार्थ की अवस्था, दशा या भाव का बोध कराते हैं, उन शब्दों को भाववाचक संज्ञा कहते हैं।

जैसे- बचपन, बुढ़ापा, मोटापा, मिठास, उमंग, चढाई, सुन्दरता आदि।

ताजमहल की सुंदरता का वर्णन करना बहुत ही कठिन है ।

सुंदरता शब्द से सुंदर होने के भाव का बोध हो रहा है। अतः सुंदरता एक भाववाचक संज्ञा शब्द है।

20. "**अव्यय**" शब्द के कितने भेद होते है?

A. 2 B. 3

C. 4 D. 5

Ans. C

Sol. अव्यय का शाब्दिक अर्थ होता है – जो व्यय न हो। जिनके रूप में लिंग , वचन , पुरुष , कारक , काल आदि की वजह से कोई परिवर्तन नहीं होता उसे अव्यय शब्द कहते हैं।

अव्यय का मूल रूप स्थिर रहता है,कभी बदलता नहीं है। जैसे – आज, काल, किन्तु, परन्तु

अव्यय के भेद :-

1) क्रिया-विशेषण अव्यय – धीरे – धीरे, प्रतिदिन

2) संबंधबोधक अव्यय – आगे, पीछे

3) समुच्चयबोधक अव्यय – और, जो ...तो,यदि...तो

4) विस्मयादिबोधक अव्यय – वाह!, आह!

21. निम्न में से **शुद्ध वाक्य** है।

A. मै रात में बाजार घुमने गया था B. मैने रात में बाजार घुमने गया था

C. में रात में बाजार घुमने गया था D. मै रत में बाजार घुमने गया था

Ans. A

Sol. वाक्य - दो या दो से अधिक शब्दों के सार्थक समूह को वाक्य कहते हैं।

"मै रात में बाजार घुमने गया था" वाक्य सही है अन्य विकल्प अशुद्ध है।

22. ठंडा दूध पीना लाभदायक होता है" में कौन-सा विशेषण है -

A. संख्यावाचक विशेषण B. गुणवाचक विशेषण

C. परिमाण वाचक विशेषण D. सार्वनामिक विशेषण

Ans. B

Sol. जिस विशेषण से किसी संज्ञा सर्वनाम का गुण प्रकट हो, उसे गुणवाचक विशेषण कहते है। इसके अंतर्गत :- गुण: अच्छा,चालक,बुद्धिमान आदि दोष:: बुरा,गंदा,दुष्ट आदि रंग: काला,लाल आदि आकार: लंबा,छोटा,गोल आदि अवस्था: बीमार,घायल आदि स्थान: पंजाबी,भारतीय,बंगाली आदि आते है।

23. मेरे से मत पूछो दिये गये वाक्य में किस प्रकार की अशुद्धी है?

A. संज्ञा संबंधी अशुद्धी B. लिंग संबंधी अशुद्धी

C. सर्वनाम संबंधी अशुद्धी D. कारक संबंधी अशुद्धी

Ans. C

Sol. मेरे से मत पूछो इस वाक्य में सर्वनाम संबंधी अशुद्धी है क्योंकि मेरे से के स्थान पर मुझसे सर्वनाम आएगा ।

वाक्य रचना में संज्ञा , सर्वनाम, विशेषण, क्रिया , अव्यय, से संबंधित या अन्य प्रकार की अशुद्धी हो सकती है ।

24. "हो सकता है राजेश आ जाये।" वाक्य है –

A. संदेहवाचक
B. विस्मयवाचक
C. निषेधवाचक
D. विधानवाचक

Ans. A

Sol. जिन वाक्यों से संदेह या संभावना का ज्ञान हो उन्हें संदेहवाचक वाक्य कहते है।
जैसे - हो सकता है आज बारिश हो।

25. राम खाकर खेलने लगा। में कौनसी क्रिया है?

A. पूर्वकालिक
B. सहायक
C. संयुक्त
D. इनमें से कोई नहीं|

Ans. A

Sol. दिए गए वाक्य **राम खाकर खेलने लगा** में पूर्वकालिक क्रिया है। जब KARTA एक क्रिया को संपन्न करके तत्काल दूसरी क्रिया को आरंभ कर देता है तो वहाँ पूर्वकालिक क्रिया होती है। जैसे- वह गाकर सो गया।

26. Consider a shaft having dimension as $35^{-0.009}_{-0.025}$. Determine the values of tolerance & fundamental deviation respectively:

A. $\pm 0.008, -0.025$
B. $-0.008, -0.025$
C. $\pm 0.008, -0.009$
D. $0.016, -0.009$

Ans. D

Sol. Given:
Shaft (max) = 35 – 0.009 = 34.991
Shaft (min) = 35 – 0.025 = 34.975
Therefore, Tolerance =Shaft (max) - Shaft (min) =34.991-34.975=0.016
Fundamental deviation is the algebraic difference between the size nearest to basic size and basic size.
Fundamental deviation=34.991-35=-0.009

27. A single degree of freedom free damped vibratory system is underdamped.The amplitude follows

A. Linear decay
B. Exponential decay
C. Parabolic decay
D. Hyperbolic decay

Ans. B

Sol. When a single degree of freedom free damped system is underdamped,the amplitude of motion reduces with time in an Exponential manner.

28. Which of the following types of fuel gas is commonly used in gas welding?

A. Biogas
B. Coal gas
C. Acetylene
D. Methane

Ans. C

Sol. Gas welding is usually referred as oxy welding or oxy-fuel welding which is a process of joining metallic materials by application of heat produced by the gas flame. In gas welding, acetylene is commonly used as fuel gas which mixed with proper proportion of oxygen in a mixing chamber of welding torch. Gas welding can produce a hot flame of temperature about 3000-3500 ^{0}C.

29. The correct description of end effector – Interchangeable fingers is

A. It is a mechanical gripper with two gripping devices in one end effector

B. Mechanical gripper with an arrangement to have modular finger's to accommodate different size work part

C. Mechanical gripper as per the general anatomy of human hand.

D. Mechanical gripper with sensory feedback capabilities in fingers to Aid locating work part.

Ans. B

Sol. The description of end effector – Interchangeable fingers is Mechanical gripper with an arrangement to have modular finger's to accommodate different size work part .

30. A grinding wheel is specified as 49 A 46 M 7 V 24. This grinding wheel is used for

A. Roughing operation
B. Semi finishing
C. Finishing
D. None of above

Ans. B

Sol. The third number from the left in series represent the abrasive size. Hence 46 is the size of the abrasive.

10-24 → Roughing

24-60 → Semi finishing

61 -180 → Finishing

Therefore this grinding wheel is used for semi finishing operation.

31. The relation between number of members(m) and number of joints (j) for the frame structure to be perfect is given by-

A. m=2j-5
B. j=2m+5
C. m=2j-3
D. m=2j+5

Ans. C

Sol. Perfect frame is that frame which satisfy the equation-

m=2j-3 where,

m= number of members

j= number of joints,

The frame which do not satisfy the above relation are imperfect frames.

32. Forecasting provides guide lines on

A. how many of the products produced are likely to be demanded by the customers

B. amount of business, the firm can expect during the planning period

C. materials requirements

D. all of these

Ans. D

Sol. Planning for future events is an integral aspect of operating any business. Planing allows actions to be taken that will meet lead time requirements and create a competitive operation. The process of planning, however, assumes that forecasts of the future are readily available. Manufacturers must anticipate future demand for products or services and plan to provide capacity and resources necessary to meet that demand. Forecasting is the first step in planning. It is one of the most important tasks, as many other organizational decisions are based on a forecast of the future. The quality of these decisions can only be as good as the quality of the forecast upon which they are based.

33. What is the value of tracking signal if the errors during a 6 week trial for a certain data are: -20, 10, 15, 3, 7, 12?

A. 1.5 B. 3.5

C. 2.4 D. 4.0

Ans. C

Sol. Tracking signal $= \frac{\text{CFE}}{\text{MAD}}$

Cumulative forecast error (CFE):

$= -20 + 10 + 15 + 3 + 7 + 12$

$= 27$

Mean absolute deviation, (MAD)

$$= \frac{|-20| + |10| + |15| + |3| + |7| + |12|}{6}$$

$$= \frac{67}{6}$$

$$\text{Tracking signal} = \frac{27 \times 6}{67} = 2.41$$

34. The full form of the "SCARA" robot is

A. Search compliance assembly robot arm

B. Selective conformance arrangement robot arm

C. Selective compliance assembly robot arm

D. Search conformance arrangement robot arm

Ans. C

Sol. "SCARA" full form is selective compliance assembly Robot Arm

35. Resilience of a material is considered when it is subjected to

A. Frequent heat treatment
B. Thermal stresses
C. Creep
D. Shock loading

Ans. D

Sol. Resilience is a amount of energy absorb within elastic limit.Resilience of a material is important when it is subjected to shock loading.

36. The generatrix and directrix, both are straight line in machining process.The surface obtained is

A. Cylindrical
B. Plain
C. Surface of revolution
D. None of above

Ans. B

Sol. The line generated by cutting motion is called generatrix and the line from the feed motion is termed as directrix. When both generatrix and directrix are straight line, the surface obtained is plain ie. shaping.

37. In a slider-crank mechanism, the crank is rotating with an angular velocity of 10 rad/s in clockwise direction. At the instant when the crank is perpendicular to the direction of the piston movement, velocity of the piston is 4 m/s.The Radius of the crank is

A. 0.4 cm
B. 4 cm
C. 40 cm
D. 400 cm

Ans. C

Sol. Velocity of the piston is $V_p = r^{\omega\left(\sin\theta+\frac{\sin 2\theta}{n}\right)}$

When crank is perpendicular to the direction of piston movement $\theta = 90^{o}$

So $Vp = r\omega$

$= r = \frac{V_p}{\omega} = \frac{4}{10} = 0.4$ m

= 40 cm

38. Which of the following properties depends on the crystal imperfection?

A. Density
B. Yield stress.
C. Elastic Constant
D. None of these

Ans. B

Sol. The properties which depend on the crystal imperfection are

1. Electrical conductivity
2. Yield stress
3. Creep
4. Fracture strength
5. Work Hardening

Density, Elastic constant depend on crystal structure.

39. A homegeneous and isotropic material have bulk modulus(K) and poisson's ratio(μ) as 80GPa and 0.3 respectively.The young's modulus of elasticity is

A. 0 GPa
B. 96 GPa
C. 170 GPa
D. 210 GPa

Ans. B

Sol. Given,

Bulk modulus(K) = 80Gpa

Poisson's ratio(μ) = 0.3

E=3K(1-2μ)

= 3 x 80 (1- 2x 0.3)

= 96GPa

40. Simplex method is used for

A. Linear programming
B. Queuing theory
C. Network analysis
D. Value engineering

Ans. A

Sol. * The Simplex Method or Simplex Algorithm is used for calculating the optimal solution to the linear programming problem.

* The simplex algorithm is an iterative procedure carried systematically to determine the optimal solution from the set of feasible solutions.

41. A machine component is subjected to 2-D stresses. The tensile stress in the X- direction varies from 30 to 50 MPa while the tensile stress in the Y-direction varies from 20 to 40 MPa. The mean stress (in MPa) is

A. $10\sqrt{3}$
B. $10\sqrt{37}$
C. 40
D. 30

Ans. A

Sol. Given,

Stress in X-direction varies from 30 to 50 MPa

Stress in Y-direction varies from 20 to 40 MPa

For 2D stress

$$\sigma_m = \sqrt{(\sigma_{xm})^2 + (\sigma_{ym})^2 - \sigma_{xm}\sigma_{ym}}$$

$$\sigma_{xm} = \frac{(30+50)}{2} = 40 \text{ Mpa}$$

$$\sigma_{xm} = \frac{(30+50)}{2} = 40 \text{ Mpa}$$

$$\sigma_{ym} = \frac{(20+40)}{2} = 30 \text{ Mpa}$$

$$\sigma_m = \sqrt{(\sigma_{xm})^2 + (\sigma_{ym})^2 - \sigma_{xm}\sigma_{ym}}$$

$$= \sqrt{(40)^2 + (30)^2 - 40 \times 30}$$

$$= 10\sqrt{13}$$

42. A vibration isolation system with transmissibility ratio of 0.25 is subjected to disturbing force of 500N.The amount of force transmitted to the ground will be

A. $5\sqrt{5}$ N
B. 50 N
C. $5\sqrt{10}$ N
D. 125 N

Ans. D

Sol. Given

Transmissibility Ration (ε_T) = 0.25

Disturbing Force (F) = 500 N

$$\text{Transmissibility Ratio } (\varepsilon_T) = \frac{F_T}{F}$$

$F_T = 0.25 \times 500 = 125$ N

43. In Induction Hardening of the specimen ,as the frequency of the magnetic field increases

A. The depth of penetration increases.
B. The depth of penetration decreases.
C. The depth of penetration remains same.
D. None of above.

Ans. B

Sol. In Induction Hardening, the surface of specimen is hardened by heating the specimen in a high frequency magnetic field.The depth of penetration is inversely proportional to frequency

$$d \propto \frac{1}{f}$$

Hence As, frequency increases, the depth of penetration decrease.

44. Which of the following is/are the advantages of welded joint over Riveted joints?

1) The cost is lower
2) The joints are separable
3) Joints are used for metals like aluminium alloys
4) These joints are light and leak proof

A. 1 and 4
B. 1, 3 and 4
C. 1 and 3
D. All of the above

Ans. A

Sol. The advantages of Welded joints are

1. The cost is lower
2. These joints are light and leak proof

Riveted joints advantages

1. Joint are used for metal wild poor weld ability like aluminium alloy
2. More reliable to vibration.

45. A toy car is made by a group of students for analyzing the effect of various forces in running a car. The car works with help of a slider crank mechanism fitted inside the toy car. The crank moves with a constant angular velocity of 10 rad/s and the crank radius is 60 mm. If the mass of the slider is 0.2 kg due to which wheel tends to leave the surface then find the hammer blow acting on the car.

A. 6 N
B. 1.2 N
C. 2.2 N
D. 6.9 N

Ans. B

Sol. Given

radius(r)=60 mm

mass (m)=0.2 kg

Angular Velocity(ω)=10 rad/s

Hammer blow is the maximum primary unbalanced force acting on the car in vertical direction

Hammer Blow = $mr\omega^2$

Hammer Blow = $0.2 \times 0.06 \times 100$

Hammer Blow = 1.2 N

46. What is the optimum tool life for maximum productivity ,if the tool change time is 2 min and tool index (n) is 0.2 ?

A. 6 min.
B. 4 min.
C. 8 min.
D. 12 min.

Ans. C

Sol. Tool change time (T_C) = 2 min

Tool index (n) = 0.2

For maximum production

$$\text{Tool life (T)} = \left(\frac{1-n}{n}\right) T_c$$

$$\text{Tool life (T)} = \left(\frac{1-0.2}{0.2}\right) \times 2$$

Tool life (T) = 8 min.

47. A cylindrical riser of diameter D is being used as top riser in a gating system. The height of the riser for optimum condition is

A. D

B. $\frac{D}{3}$

C. $\frac{D}{2}$

D. $\frac{D}{4}$

Ans. C

Sol. Under optimum condition the height of the cylindrical top riser is half of the diameter of cylinder

$$H = \frac{D}{2}$$

For side Riser, under optimum condition

H = D

48. Grey Cast Iron is

A. Iron with gray colour.

B. Iron in which carbon is in combined form.

C. Iron in which graphite is in flakes form.

D. Iron in which graphite is in spherical form.

Ans. C

Sol. In grey cast Iron, the graphite is in the form of flakes,because of graphite flakes the fractured surface have grey appearance. Due to graphite lubrication, grey cast Iron is easily machinable.

49. Formula for free float is given by

where E_i = Earliest Start Time of tail event

E_j = Earliest Finish Time of head event

L_i = latest start time of tail event

L_j = latest Finish Time of head event

t_{Eij} = Activity duration

A. $FF=L_j-(E_i+t_{Eij})$

B. $FF=E_j-(E_i+t_{Eij})$

C. $FF=E_j-(L_i+t_{Eij})$

D. None

Ans. B

Sol. Free Float is the amount of time that an activity can be delayed without delaying the early start date of any successor activity.

Formula for free float is given by $FF=E_j-(E_i+t_{Eij})$

50. A sudden jump anywhere on the Bending moment diagram of a beam is caused by

A. Couple acting at some other point

B. Concentrated load at that point

C. Couple acting at that point

D. Uniformly distributed load on beam

Ans. C

Sol. A sudden jump anywhere on the bending moment diagram of a beam is caused by couple acting at that point.

51. The trajectory of a projectile in a vertical plane is given by $y = 5x - 4x^2$. The radius of curvature of the path of the projectile at the topmost point is

A. ¼ m
B. 1/5 m
C. 1/8 m
D. 1/10 m

Ans. C

Sol.

$$\text{Radius of curvature, } R = \left|\frac{\left(1+\left(\frac{dy}{dx}\right)^2\right)^{3/2}}{\frac{d^2y}{dx^2}}\right|$$

$$\text{at top most point, } \frac{dy}{dx} = 0$$

$$R = \left|\frac{1}{\frac{d^2y}{dx^2}}\right| = \frac{1}{8}$$

52. A helical spring of constant k is cut into 3 equal pieces and the 3 pieces are then combined in parallel. The equivalent spring constant will be

A. k/9
B. 3k
C. k/3
D. 9k

Ans. D

Sol. When the spring is cut into 3 equal pieces then the stiffness of each part will be 3k.
Now they are combined in parallel, therefore equivalent spring constant = 3k+3k+3k = 9k.

53. In wire drawing process, for heavy reduction in diameter

A. Soap solution is used.
B. Graphite is used.
C. Copper sulphate is used.
D. Linseed oil is used.

Ans. B

Sol. For heavy reduction solid lubricant like soap powder or graphite is used.For light reduction soap solution is used.

54. A circular shaft is subjected to a twisting moment of 8Nm and a bending moment of 6Nm. Calculate the equivalent Twisting Moment on the shaft.

A. 9 Nm
B. 10 Nm
C. 11 Nm
D. 12 Nm

Ans. B

Sol. Given

Twisting moment = 8 Nm

Bending moment = 6 Nm

Equivalent Twisting Moment is given as

$T_e = \sqrt{M^2 + T^2} = \sqrt{6^2 + 8^2} = 10$ Nm

55. The activity time in PERT is given by

A. Normal distribution
B. Beta distribution
C. Gamma distribution
D. Poisson distribution

Ans. B

Sol. In PERT activity distribution is Beta distribution

In PERT project distribution is normal distribution.

56. Velocity of sliding at the beginning of engagement of the two gears = $(\omega_p + \omega_g)$ x _____

A. Path of contact
B. Arc of contact
C. Arc of approach
D. Path of approach

Ans. D

Sol. Velocity of sliding at the beginning of engagement = $(\omega_p + \omega_g)$ x path of approach.

Similarly, the velocity of sliding at the end of engagement = $(\omega_p + \omega_g)$ x Path of recess.

57. Which of the following are the benefits of inventory control?

1). Improvement in customers relationship.

2). Economy in purchasing

3). Elimination of the possibility of duplicate ordering:

Select the correct answer using the code given below.

A. 1, 2 and 3
B. 1 and 2 only
C. 2 and 3 only
D. 1 and 3 only

Ans. B

Sol. Benefits of inventory control

1). Improvement in customers relationship.

2). Economy in purchasing.

58. Which of the following is correct regarding slip plane?

A. The slip plane is the plane of highest atomic density
B. The slip plane is the plane of lowest atomic density
C. There is no dependency of slip plane on atomic density
D. None of the above

Ans. A

Sol. The slip plane is the crystallographic plane along which distortion line moves. The slip plane is the plane of highest atomic density.

59. The forging operation for making Bolt heads is

A. Press forging
B. Upset forging
C. Drop forging
D. Swaging

Ans. B

Sol. Upsetting is the forging process the which a localized forging takes place. It is used to produce bolt heads. The rod on which bolt head is to be produced is held and blows are given over the overhang portion.

60. The property of the material to regain its original shape after deformation when the external forces are removed is _____.

A. Plasticity
B. Elasticity
C. Durability
D. None of these

Ans. B

Sol. Elasticity is the ability of an object or material to resume its normal shape after being stretched or compressed; stretchiness.

61. A simply supported beam of constant flexural rigidity and length 2L carries a concentrated load P at its mid-span and the deflection under the load is δ. If a cantilever beam of the same flexural rigidity and length L is subjected to a load P at its free end, then the deflection at the free end will be

A. δ/2
B. δ
C. 2δ
D. 4δ

Ans. C

Sol. For a simply supported beam,

$$\delta_1 = \frac{P(2L)^3}{48EI} = \frac{PL^3}{6EI}$$

For a cantilever beam,

$$\delta_2 = \frac{P(L)^3}{3EI} = 2\delta_1$$

62. Bending stress in a component varies from 100 MPa to 300 MPa. If ultimate strength, yield strength & endurance limit are 600 MPa, 400 MPa & 300 MPa respectively, what will be the factor of safety according to Soderberg's criterion?

A. 1.2
B. 1.4
C. 1.6
D. 2.4

Ans. A

Sol. Given

σ_{max} = 300 MPa

σ_{min} = 100 MPa

$$\sigma_m = \frac{\sigma_{max} + \sigma_{min}}{2} = 200 \text{ MPa}$$

$$\sigma_v = \frac{\sigma_{max} - \sigma_{min}}{2} = 100 \text{ MPa}$$

According to Soderberg's criterion,

$$\frac{\sigma_m}{\sigma_{yt}} + \frac{\sigma_v}{\sigma_e} = \frac{1}{N}$$

$$\frac{1}{2} + \frac{1}{3} = \frac{1}{N}$$

N = 1.2

63. If the ratio of the length of a connecting rod to the crank radius increases then

A. Primary unbalanced force decrease

B. Primary unbalanced force increase

C. Secondary unbalanced force decrease

D. Secondary unbalanced force increase

Ans. C

Sol. Secondary unbalanced force $= \frac{mr\omega^2 \cos 2\theta}{n}$

Where, $n = \frac{l}{r}$

As n increases, secondary unbalance force decreases.

64. Which of the following is/are the functions of microprocessor?

A. If performs the logical and mathematical operations using its ALU.

B. It controls data flow in a system and hence can transfer data from one location another.

C. It takes necessary decision.

D. All of above

Ans. D

Sol. A microprocessor performs the following functions:

If performs the logical and mathematical operations using its ALU.

It controls data flow in a system and hence can transfer data from one location another.

It takes necessary decision.

65. In Charpy Impact test the specimen is

A. In horizontal position
B. In vertical position
C. In Hanging position
D. In inclined position

Ans. A

Sol. In charpy impact test ,a horizontal specimen with a notch of 45° is taken.The specimen is simply supported and a hammer is dropped which breaks the specimen and all readings are measured.

66. The wrong statement about AC and DC power sources for arc welding is

A. The problem of magnetic blow is greatly reduced with AC power source.
B. Arc stability is higher with DC power source.
C. The DC power source provides high efficiency.
D. AC power sources are considerably less expensive.

Ans. B

Sol. In DC welding arc stability is poor due to a phenomenon ARC BLOW.Hence suggested method to avoid arc blow and to have more arc stability is to change to AC welding,because of the continuous change in the polarity ,the effect of magnetic field is nullified.

67. A solid uniform metal bar of diameter D and length L is hanging vertically from its upper end. The elongation of the bar due to self weight is

A. Proportional to L and inversely proportional to D^2
B. Proportional to L^2 and inversely proportional to D^2
C. Proportional to L but independent of D
D. Proportional to L^2 but independent of D

Ans. D

Sol. Elongation of the uniform bar due to its self weight =

$\frac{WL}{2AE}$ .....(1)

Where,

W = self weight

L = length of bar

A = cross sectional area

E = modulus of elasticity

Now,

W = self weight = γAL

γ = weight density

Replacing W in equation (i), we will get that elongation is proportional to L^2 and independent of D.

$\delta = \frac{\gamma L^2}{2E}$

68. Which of the following components is not used in On-line tool monitoring system?

A. Dynamometer
B. Amplifier
C. Data Acquisition
D. Decision making system

Ans. D

Sol. The on-line tool monitoring system consists of

1. Dynamometer
2. Amplifier
3. Data acquisition system
4. Signal processing

69. If $S = 6t^2 + 8t$ find average acceleration from 0 sec to 3 sec. (in m/s^2)

A. 36
B. 18
C. 16
D. 12

Ans. D

Sol. Given,

$S = 6t^2 + 8t$

$$V = \frac{ds}{dt} = 12t + 8$$

$$\text{and } a_{avg} = \frac{V_3 - V_0}{t_3 - t_0} = \frac{36}{3} = 12 \text{ m/s}^2$$

70. Which of the following is a statically determinate beam?

A. Continuous beam
B. Propped cantilever beam
C. Fixed beam
D. Cantilever beam

Ans. D

Sol. Cantilever beam is a statically determinate beam.

In statically determinate beam number of reactions(3) is equal to the number of equations of force(2) and moment(1).

So, the correct option is (d).

71. To improve the directional solidification for difficult casting geometric _____ is used

A. Chill
B. Parting gate
C. Step gate
D. Runner extension

Ans. A

Sol. When the material is poured inside the mould cavity, a solidification front will start from cold wall called primary dendrite. Due to presence of murshy zone another solidification front will start from murshy zone and it will travel away from centre. When primary and secondary dendrite meet, there will be a void.

Chill are used to reduce the formation of secondary dendrite.Chills are blocks of same materials kept inside mould cavity and as soon as liquid metal comes in contact with these chill, the velocity of primary dendrites increase which does not give any chance for secondary dendrite.

72. The operation in a lathe used for producing a serrated surface is known as

A. Facing
B. Parting
C. Knurling
D. Laping

Ans. C

Sol. Knurling is a metal working operation done in lathe. Knurling tool having the serrations is forced on to the work piece material thus deforming the top layer. This forms a top surface, which is rough and provides a proper gripping surface.

73. The natural frequency of an undamped vibrating system is 100 rad/s. A damper with a damping factor of 0.8 is introduced into the system. The frequency of vibration of the damped system, in rad/s, is

A. 60
B. 75
C. 80
D. 100

Ans. A

Sol. $\xi < 1$, hence it is underdamped vibration case.

$\therefore$ Frequency of the system,

$$\omega_d = \sqrt{1-\xi^2}.\omega_n$$

$$= \sqrt{1-0.64} \times 100 = 60$$

74. Which of the following sensors is used to detect non-magnetic materials ?

A. Hall affect sensor
B. Proximity switches.
C. Inductive proximity switch
D. Eddy current sensor

Ans. D

Sol. Eddy current proximity sensors are used to detect non-magnetic, but conductive materials. This comprises of coil, an oscillator, a detector and a triggering circuit.

75. Which type of materials can be machined using Abrasive jet machining?

A. Glass
B. Ceramics
C. Hard materials
D. All of the mentioned

Ans. D

Sol. Materials like ceramics, glass, hard and super hard materials can be machined using Abrasive jet machining.

76. Mild steel can be converted into high carbon steel by using which of the following process?

A. Annealing
B. Normalizing
C. Case hardening
D. None of the mentioned

Ans. C

Sol. Case hardening increases carbon content of steel by adding some carbon to it. It imparts hardness to iron.

77. The correct statement about motion programming method is

A. This method is typically used with cartesian coordinate robot

B. Robotic type with rotational joint rely on interpolation process

C. This method overcomes the difficulties of lead through programming

D. All of the above

Ans. D

Sol. The motion programming method is typically used with cartesian coordinate robot. But robotic type with rotational joint rely on interpolation process.This method overcomes the difficulties of lead through programming.

78. The diameter of a rivet is 0.6 times the pitch. What is the efficiency of the joint? (Assume the diameter of hole is equal to diameter of a rivet)

A. 60% B. 40%

C. 35% D. Insufficient data

Ans. B

Sol. Gievn,

Efficiency of joint = (1 – d/p) X 100

d = 0.6p

Therefore, efficiency = (1 – 0.6) X 100 = 40%

79. In a NC machine to drive the work table by a distance of 300 mm, the total angular movement (in degrees) of a lead screw with a pitch of 6 mm is?

A. 15000 B. 18000

C. 20000 D. 22000

Ans. B

Sol. Given:

Pitch = 6mm

Since pitch is distance travelled in one revolution = 6 mm

Thus, No. of revolution to travel a distance of 300 mm = 300/6 =50 revolution

1 revolution = 360 degrees

Thus, 50 revolution = 360 x 50 = 18000 degrees

80. Which of the following method use to measure the toughness of a part?

A. Charpy testing B. Izod testing

C. Drop weight testing D. All of the above

Ans. D

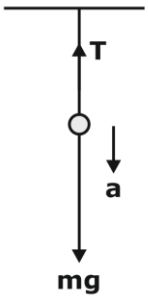
Sol. All the above given methods are used to measure the toughness of a part

81. A lamp is fitted vertically downward by a wire inside a lift which is moving downward with an acceleration of 5.5 m/s^2. If the tension in the wire is (F_T) 12.0N, find the mass of the lamp?

A. 1.78 kg
B. 2.78 kg
C. 1.95 kg
D. 2.58 kg

Ans. B

Sol. Consider the free body diagram:



As the acceleration is downward, total force acting on lamp will be:

$F_{net} = F_g - F_T$

$m (5.5) = m (9.81) - 12.0$

$4.31\ m = 12$

$m = 2.78$ kg

82. What will be the magnitude of the force P needed to just impend the motion of the block? (If the weight of the block is 80N and coefficient of friction is 0.4)

A. 80N
B. 0N
C. 32N
D. 112N

Ans. C

Sol. The magnitude of the force P needed to just impend the motion of the block will be equal to the limiting friction or maximum static friction –

$P = f_r = \mu N$

$P = 0.4 \times 80 \rightarrow 32$ N (N=Mg =80 N)

83. Which of the following welding process is used to weld ends of two pipes of uniform cross-section?

A. spot welding
B. seam welding
C. projection welding
D. upset butt welding

Ans. D

Sol. Upset butt welding is a welding technique that produces coalescence simultaneously over the entire area of abutting surfaces or progressively along a joint, by the heat obtained from resistance to electric current through the area where those surfaces are in contact.

84. Which ratio defines the height of a porter governor to that of the watt governor for equal arm and link lengths, where m is the mass of the ball and M is the mass of the sleeve?

A. $\frac{m}{M+m}$ B. $\frac{M}{M+m}$

C. $\frac{M+m}{m}$ D. $\frac{M+m}{M}$

Ans. C

Sol. right option is C

Mass of the central load (M) increases the height of governor in the ratio (m+M)/m

where m = Mass of the ball, and

M = Mass of the load on the sleeve.

85. Which of the following is autogenous type of welding

A. Braze welding B. Thermit welding

C. Submerged arc welding D. Ultrasonic welding

Ans. D

Sol. An **autogenous weld** is a form of welding where the filler material is either supplied by melting the base material or is of identical composition. Solid state welding processes are also the autogenous welding processes.

Examples:

- Friction welding or Friction stir welding (FSW).
- Ultrasonic welding
- Forged and diffusion welding.

86. Misrun and cold shut casting defect are caused by

A. Faulty moulding flask B. Lower pouring temperature

C. Lower strength of solidified metal. D. Higher pouring temperature.

Ans. B

Sol. Cold shut is defect in which the two streams of molten metal are not able to fuse together. Misrun is the defect in which the molten metal is not able to fill the whole mould cavity. These defects are removed by giving a superheat to pouring metal above its poring temperature, which increases its fluidity.

87. Which of the following is true in pressurized gating system?

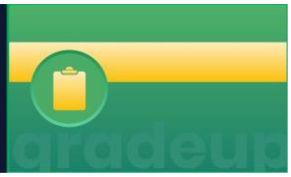
A. The ingate area is the smallest

B. A back pressure throughout the gating system is maintained

C. The metal is more turbulent

D. All of above.

Ans. D



Sol. In case of pressurized gating system, the ingate are is the smallest, thus maintaining a back pressure throughout the gating system, because of this back pressure in gating system the metal is more turbulent.

88. A Rolling process is done using two roller of diameter 400 mm.The coefficient of friction is 0.3. The maximum draft possible (in mm) is

A. 8 B. 4

C. 18 D. 14

Ans. C

Sol. D = 400 mm

R = 200 mm

μ= 0.3

The maximum possible draft is the maximum possible reduction in the thickness

$(\Delta H)_{max} = \mu^2 R$

$(\Delta H)_{max} = (0.3)^2 \times 200$

$(\Delta H)_{max} = 18$ mm

89. The distance measured along the circumference of the pitch circle from a point on one tooth to the same point on the adjacent tooth is called _____

A. backlash B. circular pitch

C. tooth thickness D. tooth space

Ans. B

Sol. Circular pitch is the distance measured along the circumference of the pitch circle from a point on one tooth to the same point on the adjacent tooth. So basically, it is the distance between corresponding points of consecutive gear teeth.

$P_C = \pi d / T$ (where P_c is the circular pitch, d is the standard pitch diameter and T is the number of teeth.)

90. Two bullets are fired simultaneously in horizontal direction with different speeds from the same position. Which bullet will hit the ground first?

A. The faster one B. The slower one

C. Both will reach simultaneously D. Depends on the masses

Ans. C

Sol. The vertical and horizontal motion of a projectile motion are independent to each other. The vertical motion of two bullets have same initial velocity and height so both will hit the ground simultaneously.

91. 4 solid balls are dropped from a certain height and their weights are m_1, m_2, m_3 and m_4 respectively. And their relation is as follows

$m_1>m_2$, $m_2>m_3$, $m_4>m_1$, $m_1>m_2$

Which ball reaches ground first?

A. m_1 B. m_1 and m_3 simultaneously

C. m_4 D. all reaches simultaneously

Ans. D

Sol. In case of free fall only gravitational acceleration is considered which is same for all the balls.

92. The shear force diagram of a cantilever beam subjected to a bending moment M at the free end will be

A. Straight line along horizontal axis B. Rectangle

C. Triangle D. Parabola

Ans. A

Sol. The shear force diagram of a cantilever beam subjected to a bending moment at the free end will be a straight line along horizontal axis because shear force will be zero.

93. Which of the following sheet metal operation induced only compressive stresses in the part?

A. Stretch Forming B. Spinning

C. Coining D. Nibbling

Ans. C

Sol. Coining is a closed die forging operation which imparts the desired variation in thickness (because of lateral constraints) to thin and flat workpiece.As the name implies, this process is widely used in producing coins.

94. When the relation $F_C = a.r + b$ is satisfied for a spring controlled governor as the relation between controlling force (F_C) and radius of rotation (r). This type of governor is known as _____.

A. stable B. unstable

C. isochronous D. hunt

Ans. B

Sol. When the relation $F_C = a.r + b$ is satisfied for a spring controlled governor.

This type of governor is known as unstable

For stable F_c=ar-b, For isochronous F_c=ar

95. The number of degrees of freedom of an epicyclic gear train is

A. zero B. One

C. Two D. Three

Ans. C

Sol. All simple gear train, compound gear train have one degree of freedom only but epicyclic gear train is one which has two degree of freedom.

96. The principle most commonly followed for locating work pieces in a fixture is:

A. 2 – 3 – 1 B. 1 – 2 – 3

C. 3 – 2 – 1 D. 1 – 3 – 2

Ans. C

Sol. 3-2-1 is the principle to locate the work piece firmly so that the required operations like drilling, reaming etc. can be done. According to the principle 3 pins are used in primary datum, 2 pins used on secondary datum which is perpendicular to 1st and 1 in tertiary datum which arrest 9 degrees of freedom.

97. The slenderness ratio of the columns is _____.

A. directly proportional to the effective length

B. directly proportional to the least radius of gyration

C. directly proportional to the square of effective length

D. directly proportional to the square of least radius of gyration

Ans. A

Sol. Slenderness ratio is the ratio of the length of a column and the least radius of gyration of its cross section.

Slenderness ratio (S) $=(l_e/k)$

thus slenderness ratio is directly proportional to the effective length of the column.

98. A joint described as U-joint in Robotics is called

A. Linear joint

B. Twisting joint

C. Orthogonal joint

D. Rotational joint

Ans. C

Sol. Linear joint → L-joint

Orthogonal joint → U-joint

Rotational Joint → R-joint

Twisting joint → T-joint

99. In ultrasonic machining, the material removal rate changes with abrasive size as

A. First increases then decreases

B. Increases

C. Decreases

D. Constant

Ans. A

Sol. By increasing the size of the abrasive grains ,the material removal rate increase.But when the size increases beyond a certain value due to mutual drag between abrasive grains the material removal rate decreases.

100. Which of the following is the disadvantage of cold working of the metals?

A. Dimensional Accuracy is less.

B. Surface finish is poor.

C. Maximum deformation is limited

D. None of above.

Ans. C

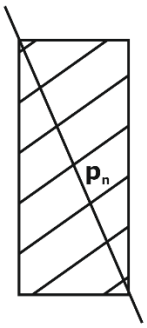
Sol. In cold working of metals, the surface finish of the part produced is good and better dimensional accuracy is achieved, but due to work hardening as deformation continues, the strength of material increases which demand very high load. Hence deformation is limited.

101. The shortest distance measured along the normal to the helix between corresponding points on the adjacent teeth is called _____

A. gear pitch
B. helical pitch
C. circular pitch
D. normal circular pitch

Ans. D

Sol. Normal circular pitch or normal pitch is the shortest distance measured along the normal to the helix between corresponding points on the adjacent teeth.



In the given figure, pn is the normal circular pitch.

pn = p cos Ψ

Therefore, mn = m cos Ψ.

Ψ= helix angle,

102. Which of the following is the function of chaplet in a sand mould?

A. Support the mould from breaking
B. Support the core during the pouring of molten metal.
C. Support the mould from moving mould walls
D. Prevent the formation of cold shuts.

Ans. B

Sol. * Chaplets are used to support the core.

* Chaplets are of Same materials as that of casting.

103. The order cost per order of an inventory is Rs. 400 with an annual carrying cost of Rs. 10 per unit. The Economic Order Quantity (EOQ) for an annual demand of 2000 units is

A. 400
B. 440
C. 480
D. 500

Ans. A

Sol. Given,

Annual demand = 2000 unit/order

Order cost per order = 400 Rs/order ,

Carrying cost = 10 Rs/ unit/year

$$EOQ = \sqrt{\frac{2DC_0}{C_h}}$$

$$= \sqrt{\frac{2 \times 2000 \times 400}{10}}$$

= 400 units

104. The Necking in the machine component subjected to external loading starts

A. From lower yield point. B. From elastic limit.

C. From ultimate point. D. From upper yield point.

Ans. C

Sol. Necking is the phenomenon in which localized deformation is observed in machine part subjected to external loading.Necking starts from the ultimate point in the stress-strain curve.

105. The defect in which an atom leaves its lattice point and settles in interstitial void is known as

A. Vacancy defect B. Line Imperfection

C. Schottky's defect D. Frenkel defect

Ans. D

Sol. When an atom leaves its lattice point and settles in the interstitial void , it is called Frenkel defect.

106. Stress can be placed under which of the following physical quantities?

A. Scalar B. Vector

C. Tensor D. Spinor

Ans. C

Sol. Stress is a 2^{nd} order tensor quantity.

107. Number of independent elastic constants for anisotropic material are-

A. 2 B. 9

C. 21 D. 15

Ans. C

Sol. Number of independent elastic constants for anisotropic material are 21.

Number of independent elastic constants for isotropic material are 2.

Number of independent elastic constants for orthotropic material are- 9

108. The dynamic load Carrying Capacity of a ball bearing is increased to 3 times without any change in the equivalent load, then life of the bearing will increase to

A. 3 times B. 9 times

C. 27 times D. 81 times

Ans. C

Sol. Life of a ball bearing is given by , $L_{10} = \left(\frac{C}{P}\right)^3$

Where C = dynamic load carrying capacity

P= equivalent load

When C is change to 3C. Then,

Life becomes 3^3 of original

i.e. It increases to 27 times[Ans]

109. To check the holes which of the following gauge is used

A. Snap gauge B. Ring gauge

C. Feeler gauge D. Plug gauge

Ans. D

Sol. Plug gauges are cylindrical in shape and used to check the dimension of the holes whether they holes are in given specified limits or not.

110. Which one of the following is a qualitative technique of demand forecasting?

A. Correlation and regression analysis

B. Moving average method

C. Delphi technique

D. Exponential smoothing

Ans. C

Sol. Delphi is a technique in which experts from different sit together and arise at forecasted value.

No mathematical tool is used to forecast the expected demand.

111. Design of thin shell under internal pressure is done on the basis of

A. Radial stress B. Longitudinal stress

C. Hoop stress D. All of the above

Ans. C

Sol. Design of thin shell under internal pressure is done on the basis of hoop stress.

112. A beam has a rectangular cross-section with width 40cm and depth 30cm. Find the moment of inertia(cm^4) of the cross-section of the beam.

A. 60000 B. 90000

C. 120000 D. 150000

Ans. B

Sol. Given,

Width = 40cm

Depth = 30cm

The Moment of Inertia of a rectangular cross-section is given as $\frac{bd^3}{12}$.

$$I = \frac{40 \times 30^3}{12} = 90000 \text{ cm}^4.$$

113. The normal stresses at a point are σ_x= 12 MPa and σ_y =6MPa; the shear stress at the point is τ_{xy} = 4MPa ,The minimum principal stress at this point is ?

A. 4 MPa B. 14 MPa

C. 3 MPa D. 5 MPa

Ans. A

Sol. Given,

σ_x= 12MPa σ_y =6MPa

τ_{xy} = 4MPa

$$\sigma_{1,2} = \frac{(\sigma_x + \sigma_y)}{2} \pm \sqrt{\left(\frac{(\sigma_x - \sigma_y)}{2}\right)^2 + r_{xy}^2}$$

$$\sigma_{1,2} = \frac{(12 + 6)}{2} \pm \sqrt{\left(\frac{(12 - 6)}{2}\right)^2 + 4^2}$$

$\sigma_{1,2}$ = 14, 4

thus minimum/minor principal stress will be = 4MPa

114. A single plate clutch effective on both sides has a mean diameter of 150mm. The axial load on the clutch plate amounts to 1000N uniformly. Taking friction coefficient equal to 0.33. Calculate the torque transmitting capacity of the clutch. (use uniform wear theory)

A. 25N-m B. 33.5N-m

C. 49.5N-m D. 45N-m

Ans. C

Sol. Given, Mean diameter D = 150mm

Radius ,R = 75mm Force, F = 1000N

Coefficient of friction, μ = 0.33

Torque, T = nμFR(n = number of effective surface. Here, n = 2)

T = 2 X 0.33 X 1000 X 0.075 N-m

T = 49.5 N-m[Ans]

115. The slope of the stress-strain curve in the elastic deformation region is equal to

A. Young's modulus B. Plastic modulus

C. Poisson's ratio D. None of these

Ans. A

Sol. The Young's modulus is the ratio of stress and strain. So on the stress strain curve, it is the slope of the curve.

116. Klein's construction gives a graphical construction for

A. Acceleration polygon

B. Velocity polygon

C. Both velocity and acceleration polygon

D. None of the above

Ans. C

Sol. Klein's construction is used to draw the graphical construction of acceleration and velocity polygon of a slider crank mechanism.

117. Which of the following is correct regarding variable reluctance motor?

A. It does not have permanent magnet. B. It has permanent magnet

C. It has low speed. D. It has high torque

Ans. A

Sol. A variable Reluctance motor

* does not have permanent magnet.

* Low torque

A permanent magnet stepper motor have

* Low speed, high torque.

118. If there are n_1 discs on the driving shaft and n_2 discs on the driven shaft in a multi-plate clutch, then the number of pairs of contact surfaces is

A. $n_2 + n_2$ B. $n_1 + n_2 - 1$

C. $n_1 + n_2 - 2$ D. $n_1 + n_2 + 1$

Ans. B

Sol. For multidisc clutch, if n_1 is the number of disc on driving shaft and n_2 is the number of disc on driven shaft than number of pairs contact surface = $n_1 + n_2 - 1$.

119. Lathe specification of swing over bed specifies

A. Maximum diameter of Job that can turned in the Lathe

B. Minimum diameter of Job that can be termed in lathe

C. Maximum radius of Job that can be termed in lathe

D. Minimum radius of Job that can be turned

Ans. A

Sol. Swing over bed specifies the maximum diameter of job that can be turned in lathe machine.

120. At point in two-dimensional stress system σ_x = 100 N/mm^2, $\sigma_y = \tau_{xy}$ = 40 N/mm^2. What is the radius of the Mohr circle for stress drawn with a scale of 1cm = 10N/mm^2 ?

A. 3cm
B. 4cm
C. 5cm
D. 6cm

Ans. C

Sol. Given,

σ_x = 100N/mm^2, $\sigma_y = \tau_{xy}$ = 40 N/mm^2

Radius of Mohr's circle ,

$$R = \sqrt{\left(\frac{100-40}{2}\right)^2 + (40)^2} = 50 \text{ N/mm}^2$$

= 5cm (1cm = 10N/mm^2)

121. Two plates of 250 mm wide and 20 mm thick are to be connected using double cover plate butt-riveted joint. Find the required diameter of the rivets used.

A. 20 mm
B. 22.83 mm
C. 26.83 mm
D. 30.9 mm

Ans. C

Sol. By Unwin's Formula:

dia of rivet is given as,

d = 6√t mm (only if t ≥ 8 mm)

= 6 × √20 = 26.83 mm

122. Which of the following Sensor has applications in measuring the displacement or position or proximity?

A. Optical encoders
B. Piezometer sensor
C. Tactile sensors
D. Thermocouples

Ans. A

Sol. Optical encoders provide a digital output as a result of linear/angular displacement. It compresses of a disc with three concentric tracks of equally spaced holes.

Three light sensors are employed to detect the light passing through holes. These sensors produce electric pulses which give the angular displacement of element.

123. Which of the following statements is/ are true in bottom gating system?

A. Less turbulence & Erosion
B. Suitable for non-ferrous materials
C. Unfavourable temperature gradient
D. All of the above

Ans. D

Sol. In Bottom gating system, the molten metal comes from bottom of mould.The solidification starts from the top of the mould,hence unfavourable temperature gradient. As less turbulence is there ,hence it is suitable for drossy materials like non-ferrous materials.

124. Which of the following statements regarding tempering is/are TRUE?

A. It is heating of martensite to introduce toughness.

B. It is the heating of martensite to introduce hardness.

C. It is the heating of austenite to lower the hardness.

D. It is the heating of austenite to introduce toughness.

Ans. A

Sol. Tempering is the heating of martensite to introduce the toughness and ductility in it. This process hardness the steel with reduction in strength.

125. The uniaxial yield stress of material is 600 MPa. According to von- mises criterion, the shear yield stress (in MPa) of the material is

A. 300

B. 200

C. $100\sqrt{3}$

D. $200\sqrt{3}$

Ans. D

Sol. Given,

Uniaxial yield stress of material = 600 MPa.

According to Von-Mises Criterion,

$$\tau_y = \frac{\sigma_y}{\sqrt{3}} = \frac{600}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 200\sqrt{3}$$

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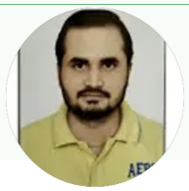

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